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MELANOSPERMEÆ,

OR

OLIVE SEA-WEEDS.

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PHYCOLOGIA BRITANNICA:

OR

A HISTORY OF BRITISH SEA-WEEDS,

CONTAINING

COLOURED FIGURES, GENERIC AND SPECIFIC CHARACTERS,
SYNONYMES, AND DESCRIPTIONS

OF

ALL THE SPECIES OF ALGÆ INHABITING THE SHORES OF THE

BRITISH ISLANDS.

BY

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IN FOUR VOLUMES.

VOL. I.

MELANOSPERMEÆ, OR OLIVE SEA-WEEDS.

SYNOPSIS, No. 1 to 97.

LONDON :

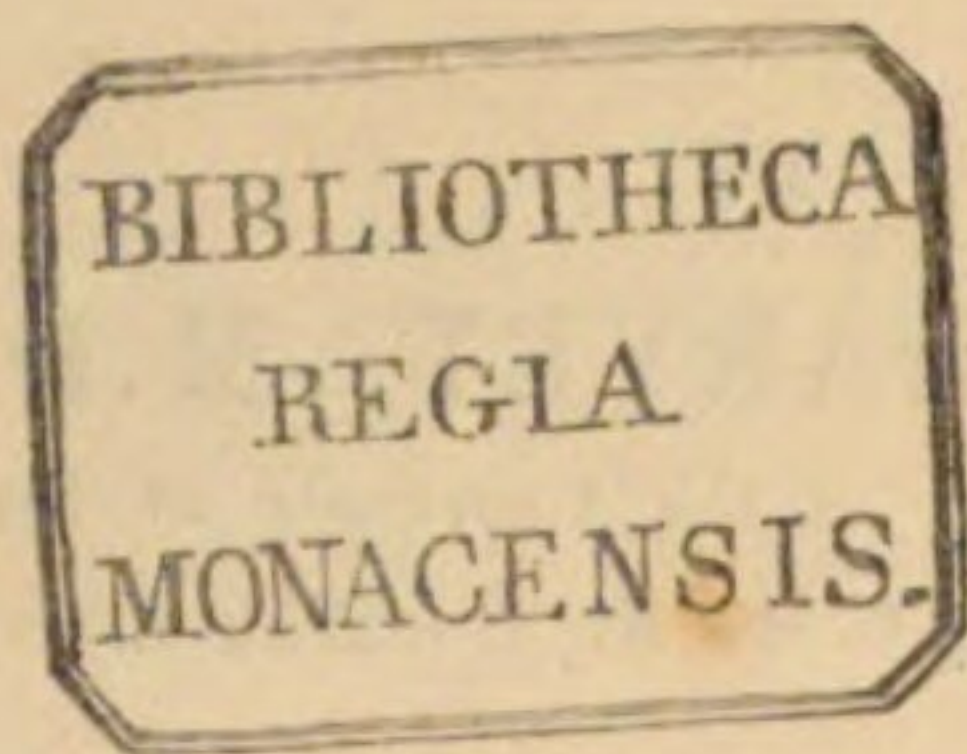
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1846-51.

Harvey
Phycologia
Britannica

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TO

SIR WILLIAM JACKSON HOOKER,

K.H., D.C.L., F.R.S., V.P.L.S., ETC., ETC.,

Director of the Royal Botanic Gardens of New,

THIS WORK IS INSCRIBED

AS A SMALL TRIBUTE OF THE WARM AFFECTION, ADMIRATION, AND GRATITUDE

OF HIS ATTACHED FRIEND,

THE AUTHOR.



P R E F A C E .

IN issuing the first part of this work, on the 1st of January, 1846, it was proposed that it should comprise figures and descriptions of all known British Marine Algæ. The number of species enumerated in the Synopsis is 388, of which 378 are figured on the 360 plates contained in these volumes. The remaining ten unfigured species are either altogether obscure and uncertain, or else are of such rarity, that I have been unable to obtain specimens of them. Of the genera *Ectocarpus*, *Polysiphonia*, *Ceramium*, *Callithamnion*, *Cladophora*, and *Enteromorpha*, of which several are now introduced for the first time to the British list, some few distinct-looking forms, preserved in my own and other herbaria, remain unfigured for further examination, and possibly some that may eventually rank as species. I am aware that already several of them have received names in the 'Species Algarum' of Kützinger, but I have hesitated adopting them, from a well-grounded fear, that in doing so without a very careful examination of specimens of all ages, I should only open the door to a flood of spurious species, and convert the study of these plants into a mere effort to arrange and describe solitary or deformed specimens. Every student of marine botany must know that the Algæ, more than most other plants, *sport* (as the gardeners phrase it) into endless varieties, sometimes on account of circumstances in their habitat, and sometimes from reasons unknown to us. *Halymenia ligulata*, *Gelidium corneum*, and many others which might be named, put on so many forms, that a botanist, unfamiliar with them or judging merely from dried specimens, could scarcely avoid making every form a distinct species. And why should we deny an equal latitude to our old friend *Ceramium rubrum*, which some modern botanists would divide into almost as many species as there are individuals? I have never been quite satisfied of the propriety of separating *C. botryocarpum*, the only new species of this group on which I have ventured; but had I followed the wishes of some of my correspondents, I should have split *C. rubrum* into at least a dozen. I felt, however, that in doing so, I should be preparing so many puzzles for those that may come after me, and that instead of the author of a future Phycologia having to tell that his predecessor had left him but ten species which he had been unable to ascertain, my successor would have at least a hundred to lay at my door. To avoid such a consummation, I have abstained from much species-splitting which has been suggested to me, and perhaps have sometimes erred, but, as I think, on the safer side, by over-caution. In a few cases, in the genera *Ectocarpus*, *Cladophora*, and *Enteromorpha*, where I have used some latitude, I have possibly gone in some cases too far. For these sins I entreat a charitable criticism on the same grounds of excuse offered by a

lively Quaker when reproved, by a graver brother, for his witticisms: "Friend, if thou knew how much I keep in, thou wouldst not find fault with what I let out." And if you, dear Critic, could know the number of puzzling forms of Algæ which in the course of the last five years have passed through my hands, and which I have had to reduce to their specific types, you would judge leniently of my mistakes, where I may have been deceived by such forms, and wrongly proposed them as new species.

Whatever may be my errors in this respect, I have the satisfaction to know that the study of British Marine Botany has been fostered and extended by this work; and this, to an author who feels a personal interest in his subject, is the best reward for his labours. A progressive taste has shown itself for these plants, in the large increase of collectors within the past five years, and in the number of my correspondents since the monthly issue commenced. Many new species have been discovered, and several others added to the British list; and several, which had not been gathered for many years previously, have been rediscovered, some in new habitats, and some in their old, but lost, stations. Very few of these discoveries or additions have been made by myself, but are due to the zeal of my correspondents, a majority of whom, familiar as I am with their handwriting and friendly feeling, are personally unknown to me.

To those kind correspondents I would now return my most grateful thanks. Their number is too great to particularize every name, and I dare not trust myself with naming many, lest I might accidentally omit some valued friend;—but there are a few to whom I cannot omit a further expression of gratitude for their unwearied assistance, and the essential service they have rendered to me. And first I would express my deep obligation to my invaluable friend Mrs. Griffiths, to whose contributions almost every page of these volumes bears witness, and without whose assistance many rare species could not have been properly illustrated. To my kind Plymouth friends, the Rev. Mr. Hore, Dr. Cocks, Mr. Rohloff, and Mr. Boswarva, I am indebted for many hundreds of beautifully preserved specimens. To Miss White and Miss Turner I owe almost all my acquaintance with the Algæ of the Channel Islands, and the latter lady has added more than one new species to our list. To Rev. Mr. Pollexfen and Dr. M'Bain I am indebted for Orkney Algæ; and to Miss Warren, Miss Ball, Miss Gifford, Miss Cutler, Mrs. Gatty, Mrs. Gulson, Mrs. Hayden, Rev. Dr. Landsborough, Dr. Dickie, Mr. Ralfs, Rev. Mr. Cresswell, &c., for specimens of the rarer Algæ of their respective neighbourhoods; and to these, and all other kind friends, whether enumerated in this place or in the body of the work, I would now record my obligations of gratitude for their liberal communications and sympathy.

W. H. H.

Trinity College, Dublin.

July 30, 1851.

ADVERTISEMENT.

IN the Introduction to my "Manual of the British Algæ," published on the eve of my last voyage to the Cape of Good Hope, I stated the strong wish that I felt of accompanying the descriptions in that little work by plates, illustrative at least of the genera, and apologised for their omission by the briefness of my stay in Europe. Since my final return home I have been frequently applied to, by persons interested in marine botany, to fulfil in some way the promise then partly held out, either by publishing a new, enlarged, and illustrated edition of the "Manual," or a new work on the same subject, and on an extended plan. After some consideration I have preferred the latter course, and undertaken the present Work, in which it is intended first to give coloured figures, accompanied by detailed descriptions, of every British species of Marine Algæ or Sea-weed; and, on the completion of this portion of the work, to add to the last volume a general Introduction to Marine Botany, and a systematic synopsis of the British Marine Flora.

The recent publication of Mr. Hassall's 'History of the British Freshwater Algæ,' in which he has given figures of all the species known to him, affords me an opportunity of limiting my attention to the *marine* algæ, which are so much more attractive to the generality of students and collectors, and thus enables me to reduce the number of plates and the consequent expense of the work very considerably.—I also propose to omit the DESMIDIEÆ

and DIATOMACEÆ, tribes of organised beings which can hardly be regarded as *genuine* Algæ, but rather as forming a Class so nearly balanced between the animal and vegetable kingdoms, that those who have most attentively studied them are divided in sentiment respecting the kingdom to which they belong. I the more readily omit them because Mr. RALFS—the LYONNET of this department of Natural History—is preparing a separate work, to be accompanied by coloured plates, on these Families. Every admirer of patient industry, acute observation, and extensive research into these hidden things of nature,—one of her worlds of whose existence, though distributed in all waters and all lands, we are unconscious till the microscope reveals them to us,—must rejoice that a work requiring so much acumen and patience has fallen into such able hands.

As some set-off against the above omissions, the present work will include the British species of *Corallina*, *Halimeda* and *Nullipora*, which recent discoveries and observations have fairly proved to belong not merely to the vegetable kingdom, but to be closely connected by affinity with many of the Algæ; in short, to be Algæ in disguise, some of them related by their fructification to *Rhodomeleæ*, others to *Batrachospermum*, and others again to *Codium* and *Bryopsis*.

With regard to the method of publication, two plans suggest themselves, each of which has its advantages. The first is, having taken a view of the whole subject, to adopt a *Systematic Order*; to commence with the first genus of the arrangement, to go regularly through the species, then those of the next and following genera, and so on to the conclusion of the work. Thus the several tribes would follow in correct order; the first plates would represent the highest or the lowest type of organization, as either was selected as a starting point, and those that followed would exhibit a regular gradation of affinity to the opposite end of the series. This is the course which, were the work to issue as a whole from the press, one would naturally follow; but in an extensive periodical work which it will take five years to complete,

on a tribe of plants among which new species are constantly being discovered or added to the Flora, this plan is open, among others, to the grave objection that it forbids the introduction or early publication of *new* species, probably of much greater interest than those which it first illustrates.

The second plan, and which, for many reasons I have adopted, is to select the species illustrated in each number from several different genera taken from as many families, so that there shall always be a variety of subjects in the monthly number; and, as early in the work as possible, *to figure one species at least of every genus*, so that by the end of the twentieth number, which will complete the first volume, illustrations of all the genera may be placed before the student. This, with the aid of the descriptions of species and sketch of a general arrangement afforded by the "*Manual*" (which may serve as a Synopsis of the principal contents of the 'Phycologia'), will afford him very great facilities for determining his plants during the progress of this work, even though the particular species which he has under examination may not be among those then figured in it. Were the plates to be published systematically, according to the first-mentioned plan, it is obvious that not till the completion of the entire work would the student have as much assistance toward understanding the genera as he will now have at the end of the first volume. This arrangement is therefore decidedly the best for those who have purchased the "*Manual*," and as it appears to me, for those also who, now commencing the study of *Algology*, wish to obtain speedily a general view of the principal varieties of marine plants. The main objection to this mode of publication is, that purchasers who wish to have their copies bound up in systematic order, must defer the binding till the whole is published. This is an inconvenience common to other similar works, to Smith and Sowerby's '*English Botany*,' Greville's '*Scottish Cryptogamic Flora*,' &c.; but it is one which, in my judgment, is outweighed by other manifest conveniences.

In concluding this Advertisement I take the liberty of soliciting

from all who feel an interest in the subject, such specimens of the rarer British Algæ from all parts of the coast, as may serve to illustrate either some peculiarity of growth, or throw light on distribution, or otherwise complete the history of the species. And I beg to assure such contributors, that it will always afford me pleasure to acknowledge their assistance, answer their queries, and communicate, in return, specimens which may be among their desiderata.

W. H. H.

Trinity College, Dublin,
Dec. 3rd, 1845.

SYNOPSIS

OF THE

ORDERS AND GENERA.

SUB-CLASS I. MELANOSPERMEÆ OR FUCALES. (Olive Seaweeds.)

Order 1. FUCACEÆ. *Olive-coloured, inarticulate seaweeds, whose spores are contained in spherical cavities of the frond.*

* *Air-vessels stalked.*

I. SARGASSUM. *Branches bearing ribbed leaves. Air-vessels simple.*

II. HALIDRYS. *Frond linear, pinnate, leafless. Air-vessels plurilocular.*

* * *Air-vessels immersed in the frond, or none.*

III. CYSTOSEIRA. *Root scutate. Frond much branched, bushy. Receptacles cellular.*

IV. PYCNOPHYCUS. *Root branching. Frond cylindrical. Receptacles cellular.*

V. FUCUS. *Root scutate. Frond dichotomous. Receptacles small, filled with mucus, traversed by a net-work of jointed threads.*

VI. HIMANTHALIA. *Root scutate. Frond cup-shaped. Receptacles very long, strap-shaped, dichotomously branched.*

Order 2. SPOROCHNACEÆ. *Olive-coloured, inarticulate seaweeds, whose spores are attached to external, jointed filaments, which are either free, or compacted together into knob-like masses.*

* *Spores attached to pencilled filaments.*

VII. DESMARESTIA. *Frond solid, distichous, filiform, or flat.*

VIII. ARTHROCLADIA. *Frond filiform, nodose, traversed by a jointed tube.*

* * *Spores in knob-like receptacles.*

IX. SPOROCHNUS. *Receptacles lateral, stalked.*

X. CARPOMITRA. *Receptacles terminal.*

Order 3. LAMINARIACEÆ. *Olive-coloured, inarticulate seaweeds, whose spores are superficial, either forming cloud-like patches, or covering the whole surface of the frond.*

XI. ALARIA. *Stipitate. Stipes ending in a midribbed leaf.*

XII. LAMINARIA. *Stipitate. Stipes ending in a ribless leaf.*

XIII. CHORDA. *Frond leafless, cylindrical, hollow; the cavity interrupted by transverse partitions.*

Order 4. DICTYOTACEÆ. *Olive-coloured, inarticulate seaweeds, whose spores are superficial, disposed in definite spots or lines (sori).*

* *Root coated with woolly fibres, frond flat.*

XIV. CUTLERIA. *Frond* ribless, irregularly cleft. *Sori* dot-like, scattered. *Spores* pedicellate, containing numerous sporules.

XV. HALISERIS. *Frond* midribbed.

XVI. PADINA. *Frond* ribless, fan-shaped, concentrically striate. *Sori* linear, concentric, bursting through the epidermis.

XVII. ZONARIA. *Frond* ribless, lobed, concentrically striate. *Sori* roundish, containing spores and jointed threads.

XVIII. TAONIA. *Frond* ribless, irregularly cleft, somewhat fan-shaped. *Sori* linear, concentric, superficial, alternating with scattered spores.

XIX. DICTYOTA. *Frond* ribless, linear, dichotomous. *Sori* roundish, scattered, bursting through the epidermis: or, (on distinct plants) scattered spores.

* * *Root a minute naked disc. Frond cylindrical, branched.*

XX. STILOPHORA. *Spores* concealed among moniliform threads, which are collected into convex, wart-like *sori*.

XXI. DICTYOSIPHON. *Spores* irregularly scattered, solitary, or in dot-like *sori*, not accompanied by moniliform threads.

XXII. STRIARIA. *Spores* in dot-like *sori*, ranged in transverse lines.

* * * *Root naked. Frond unbranched, cylindrical, or flat.*

XXIII. PUNCTARIA. *Frond* flat, leaf-like.

XXIV. ASPEROCOCCUS. *Frond* membranaceous, tubular, either cylindrical or compressed. *Spores* in dot-like *sori*, mixed with a few jointed threads.

XXV. LITOSIPHON. *Frond* cartilaginous, filiform, sub-solid. *Spores* scattered, sub-solitary.

Order 5. CHORDARIACEÆ. *Olive-coloured seaweeds, with a gelatinous or cartilaginous frond, composed of vertical and horizontal filaments interlaced together.*

* *Frond cylindrical, branching.*

XXVI. CHORDARIA. *Axis* cartilaginous, dense; filaments of the circumference unbranched.

XXVII. MESOGLOIA. *Axis* gelatinous, loose; filaments of the circumference branching.

* * *Frond either tuber-shaped, or crustaceous and spreading.*

XXVIII. LEATHESIA. *Frond* tuber-shaped.

XXIX. RALFSIA. *Frond* crustaceous.

* * * *Parasites, consisting of densely tufted filaments, connected at the base, free above.*

XXX. ELACHISTA. *Filaments* pencilled, rising from a tubercular base, composed of vertical fibres.

XXXI. MYRIONEMA. *Tufts* cushion-like; filaments rising from a flat base, composed of decumbent fibres.

Order 6. ECTOCARPACEÆ. *Olive-coloured, articulated, filiform seaweeds, whose spores are (generally) external, attached to the jointed ramuli.*

* *Frond rigid; each articulation composed of numerous cells.*

XXXII. CLADOSTEPHUS. *Ramuli* whorled.

XXXIII. SPHACELARIA. *Ramuli* distichous, mostly pinnated.

* * *Frond flaccid; each articulation formed of a single cell.*

XXXIV. ECTOCARPUS. *Frond* branching; *ramuli* scattered.

XXXV. MYRIOTRICHIA. *Frond* unbranched; *ramuli* whorled, and tipped with pellucid fibres.

SUB-CLASS II. RHODOSPERMEÆ OR CERAMIALES.

(Red* or Brown-red Seaweeds.)

Order 7. RHODOMELACEÆ. *Red or brown-red seaweeds, with a leafy or filiform, areolated or articulated frond, composed of polygonal cells. Fruit double: Conceptacles (ceramidia) external, ovate or urn-shaped, with a terminal pore, and containing a tuft of pear-shaped spores: 2. Tetraspores immersed in distorted ramuli, or contained in proper receptacles (called here stichidia).*

* *Frond flattened, pinnatifid.*

XXXVI. ODONTHALIA.

* * *Frond filiform, wholly inarticulate.*

XXXVII. RHODOMELA. *Branches* coated with minute, irregular cells. *Apices* not involute.

XXXVIII. BOSTRYCHIA. *Branches* dotted; the surface cells quadrate. *Apices* strongly involute.

XXXIX. RYTIPHLÆA. *Branches* transversely striate, at short distances.

* * * *Frond filiform, partially or generally articulate.*

XL. POLYSIPHONIA. *Articulations* of the *ramuli* two- or many-tubed. *Tetraspores* in distorted *ramuli*.

XLI. DASYA. *Articulations* of the *ramuli* single-tubed. *Tetraspores* in lanceolate pod-like receptacles (*Stichidia*).

Order 8. LAURENCIACEÆ. *Rose-red or purple seaweeds, with a cylindrical or compressed, rarely flat, linear, narrow, areolated, inarticulate, or constricted and chambered, branching frond, composed of polygonal cells. Fruit double: 1. Conceptacles (ceramidia) external, ovate, with a terminal pore, and containing a tuft of pear-shaped spores: 2. Tetraspores scattered without order among the surface cells of the branches and ramuli.*

* *Frond solid.*

XLII. BONNEMAISONIA. *Rose-red, excessively branched, distichous; ramuli* subulate, acute.

XLIII. LAURENCIA. *Purplish, yellowish, or reddish, pinnatifid or pinnate; ramuli* obtuse.

* * *Frond (at least the branches) hollow.*

XLIV. CHRYSYMENIA. *Frond* neither constricted nor chambered.

XLV. CHYLOCLADIA. *Frond* (at least the branches) constricted at intervals and chambered.

Order 9. CORALLINACEÆ. *Rigid, articulated, or crustaceous, mostly calcareous seaweeds, purple when recent, fading on exposure to milk-white, composed of cells in which carbonate of lime is deposited in an organized form. Tetraspores tufted, contained in ovate or spherical conceptacles (ceramidia) furnished with a terminal pore.*

* See also *Ulvaceæ* and *Oscillatoriaceæ* among the Green Algæ.

* *Frond filiform, articulated.*

XLVI. CORALLINA. *Frond* pinnated. *Ceramidia* terminal, simple.

XLVII. JANIA. *Frond* (in the Brit. species) dichotomous. *Ceramidia* tipped with two horn-like ramuli.

* * *Frond crustaceous or foliaceous, not articulated.*

XLVIII. MELOBESIA. Opaque, stony; crustaceous, foliaceous, or shrubby.

XLIX.? HILDENBRANDTIA. Cartilaginous (not stony), incrusting rocks.

L.? HAPALIDIUM (Kütz.). Minute, crustaceo-membranaceous, hyaline, composed of a single stratum of cells radiating from a centre.

Order 10. DELESSERIACEÆ. *Rosy or purple-red or blood-red seaweeds, with a leafy, rarely filiform, areolated, inarticulate frond, composed of polygonal cells. Leaves delicately membranaceous. Fructification double: 1. Conceptacles (coccidia) external or half-immersed, hemispherical, usually imperforate, containing, beneath a membranous pericarp, a tuft of filaments, whose cells are finally changed into spores. 2. Tetraspores in distinctly defined sori, either scattered or confined to proper leaflets (sporophylla).*

LI. DELESSERIA. *Frond* leafy, of definite form, with a percurrent midrib.

LII. NITOPHYLLUM. *Frond* leafy, irregularly lobed, without midrib.

LIII. PLOCAMIUM. *Frond* linear, compressed, distichously much branched; ramuli pectinate, acute.

Order 11. RHODYMENIACEÆ. *Purplish or blood-red seaweeds, with an expanded or filiform, inarticulate frond, composed of polygonal cells; occasionally traversed by a fibroso-cellular axis. Superficial cells minute, irregularly packed, or (rarely) disposed in excentric filaments. Fructification double: 1. Conceptacles (coccidia) external or half-immersed, globose or hemispherical, imperforate, containing, beneath a thick pericarp, a mass of spores, on a central placenta. 2. Tetraspores either dispersed indefinitely, or forming cloud-like patches.*

* *Frond flat, leaf-like, dichotomous, or palmate.*

LIV.? STENOGRAMME. *Conceptacles* linear, rib-like. (*Sori* definite.)

LV. RHODYMENIA. *Conceptacles* hemispherical, scattered.

* * *Frond compressed or terete, shrubby, much branched.*

LVI. SPHÆROCOCCUS. *Frond* linear, two-edged, distichous, traversed by an obscure midrib.

LVII. GRACILARIA. *Frond* filiform (rarely compressed or flat), irregularly branched; the central cells very large.

LVIII. HYPNEA. *Frond* filiform, irregularly branched, traversed by a fibro-cellular axis.

ORDER 12. CRYPTONEMIACEÆ. *Purplish or rose-red seaweeds, with a filiform or (rarely) expanded, gelatinous or cartilaginous frond, composed, wholly or in part, of cylindrical cells, connected together into threads or filaments. Axis formed of vertical, periphery of horizontally excentric filaments. Fructification double: 1. Conceptacles (favellidia), globose masses of spores immersed in the frond, or in swellings of the branches. 2. Tetraspores variously dispersed.*

Sub-order 1. COCCOCARPEÆ. *Frond* solid, dense, cartilaginous, or horny. Favellidia in semi-external tubercles or swellings of the frond.

- LIX. GRATELOUPIA. Pinnated, flat, membranaceo-cartilaginous, of very dense structure. *Favellidia* with a pore. *Tetraspores* scattered.
- LX. GELIDIUM. Pinnated, compressed, horny, of very dense structure. *Favellidia* in swollen ramuli, imperforate. *Tetraspores* in sori.
- LXI. GIGARTINA. *Fron*d variously branched, cartilaginous; its flesh composed of anastomosing filaments, lying apart in firm gelatine. *Favellidia* in external *tubercles*. *Tetraspores* contained in dense, immersed *sori*.

Sub-order 2. SPONGIOCARPEÆ. *Fron*d *solid, dense, cartilaginous, or horny*. *Favellidia* (*of several*) *imperfectly known*. Wart-like swellings (*or nemahtecia*) *composed of filaments, sometimes changed into tetraspores; sometimes into spores*.

- LXII. CHONDRUS. *Fron*d flabelliform, dichotomously cleft, cartilaginous; of very dense structure. *Tetraspores* in definite, immersed *sori*.
- LXIII. PHYLLOPHORA. *Fron*d stipitate, rigid-membranaceous, proliferous; of very dense structure. *Tetraspores* in superficial *sori*, or in proper leaflets.
- LXIV. PEYSSONELIA. *Fron*d depressed, expanded, rooting by the under surface, concentrically zoned. *Tetraspores* contained in superficial warts.
- LXV. GYMNOGONGRUS. *Fron*d filiform, dichotomous, horny, of very dense structure. *Tetraspores* in superficial warts.
- LXVI. POLYIDES. *Root* scutate. *Fron*d cylindrical, dichotomous, cartilaginous. *Favellæ* contained in external, spongy warts. *Tetraspores* cruciate, immersed in the branches.
- LXVII. FURCELLARIA. *Root* branching. *Fron*d cylindrical, dichotomous, cartilaginous. *Favellæ* immersed in the pod-like swollen extremities of the branches. *Tetraspores* similarly immersed, transversely zoned. (*For correct analysis, see Tab. CCCLVII. A.*)

Sub-order 3. GASTROCARPEÆ. *Fron*d *gelatinoso-membranaceous, or fleshy, hollow, or of lax texture within*. *Favellidia* *immersed in the central substance of the frond, very numerous*.

- LXVIII. DUMONTIA. *Fron*d cylindrical, tubular. *Favellidia* immersed in the wall of the frond. *Tetraspores* also immersed, cruciate. (*For corrected analysis, see Tab. CCCLVII. B.*)
- LXIX. HALYMENIA. *Fron*d compressed or flat, gelatinoso-membranaceous, the membranous surfaces connected by a few slender, anastomosing filaments. *Favellidia* attached to the inner face of the wall.
- LXX. GINANNIA. *Fron*d cylindrical, distended, traversed by a fibrous axis; the walls membranaceous, connected with the axis by horizontal filaments. *Favellidia* attached to the walls.
- LXXI. KALLYMENIA. *Fron*d expanded, leaf-like, carnososo-membranous, solid, of dense structure. *Favellidia* pimply, half-immersed in the frond, and scattered over its surface.
- LXXII. IRIDÆA. *Fron*d expanded, leaf-like, thick, carnososo-coriaceous, solid, of dense structure. *Favellidia* wholly immersed.
- LXXIII. CATENELLA. *Fron*d tubular, branched, constricted at intervals into oblong pseudo-articulations; the tube traversed by a few filaments.
- Sub-order 4. GLOIOCLADIEÆ. *Fron*d *loosely gelatinous; the filaments of which it is composed lying apart from one another, surrounded by a copious gelatine*. *Favellidia* *immersed*.
- LXXIV. CRUORIA. *Fron*d crustaceous, skin-like.

- LXXV. NACCARIA. *Fron*d filiform, solid, cellular; the ramuli (only) composed of radiating, free filaments.
- LXXVI. GLOIOSIPHONIA. *Fron*d tubular; the walls composed of radiating filaments.
- LXXVII. NEMALEON. *Fron*d filiform, solid, elastic; the *axis* composed of closely packed, vertical filaments; the periphery of moniliform, free, horizontal filaments.
- LXXVIII. DUDRESNAIA. *Fron*d filiform, solid, gelatinous; the axis composed of a net-work of anastomosing vertical filaments; the periphery of moniliform, free, horizontal filaments.
- LXXIX. CROUANIA. *Fron*d filiform, consisting of a jointed filament (*axis*), whorled at the joints with minute, multifid, moniliform, free, horizontal filaments (or ramelli).

Order 13. CERAMIACEÆ. *Rose-red or purple seaweeds, with a filiform frond, consisting of an articulated, branching filament, composed of a single string of cylindrical cells, sometimes coated with a stratum of smaller polygonal cells. Fructification double: 1. Favellæ, berry-like receptacles, with a membranous coat, containing numerous angular spores. 2. Tetraspores, attached to the ramuli, or subimmersed in their substance, scattered.*

- LXXX. PTILOTA. *Fron*d compressed, inarticulate, distichous, pectinato-pinnate. *Favellæ* stalked, involucrate.
- LXXXI. MICROCLADIA. *Fron*d filiform, inarticulate, dichotomous. *Favellæ* sessile, involucrate.
- LXXXII. CERAMIUM. *Fron*d filiform, articulate, dichotomous; the nodes opaque. *Favellæ* sessile, mostly involucrate. *Tetraspores* immersed or subimmersed.
- LXXXIII. SPYRIDIA. *Fron*d filiform, inarticulate; the branches clothed with minute, setiform, articulated ramelli. *Favellæ* stalked, involucrate. *Tetraspores* sessile on the ramelli.
- LXXXIV. GRIFFITHSIA. *Fron*d articulated, dichotomous, or clothed with whorled, dichotomous ramelli. *Favellæ* involucreted, sessile, or stalked. *Tetraspores* sessile, on whorled ramelli.
- LXXXV. WRANGELIA. *Fron*d articulated, pinnate. *Favellæ* terminal, involucreted, containing tufts of pear-shaped spores. *Tetraspores* sessile, scattered.
- LXXXVI. SEIROSPORA. *Fron*d articulated. *Tetraspores* disposed in terminal, moniliform strings.
- LXXXVII. CALLITHAMNION. *Fron*d (at least the branches and ramuli) articulate, mostly pinnate. *Favellæ* terminal or lateral, sessile, without involucre (except in *C. Turneri*) *Tetraspores* sessile or pedicellate, scattered.

SUB-CLASS III. CHLOROSPERMEÆ OR CONFERVALES.

(Grass-green* Seaweeds.)

Order 14. SIPHONACEÆ. *Green, marine, or fresh-water Algæ, composed of continuous, tubular, simple, or branched filaments (elongated cylindrical cells), free, or variously combined in cylindrical or expanded fronds.*

- LXXXVIII. CODIUM. *Filaments* combined into a spongy frond.
- LXXXIX. BRYOPSIS. *Filaments* free, pinnated.

* A few *Ulvaceæ* and *Oscillatoriaceæ* are purple.

XC. VAUCHERIA. *Filaments* free, dichotomous or irregular.

Order 15. CONFERVACEÆ. *Green, marine, or fresh-water Algæ, composed of articulated filaments, simple or branched, free or invested by gelatine. Cells cylindrical, truncate.*

Sub-order 1. CONFERVEÆ. *Filaments* free, destitute of gelatine.

XCI. CLADOPHORA. *Filaments* tufted, branched.

XCII. RHIZOCLONIUM. *Filaments* decumbent, subsimple, emitting a few root-like branches.

XCIII. CONFERVA. *Filaments* unbranched.

Sub-order 2. CHÆTOPHOREÆ. *Filaments* united in submembranaceous or gelatinous fronds; cells often tipped with bristles. Sporangia external.

XCIV. OCHLOCHÆTE. *Frond* disciform. *Filaments* radiating from a central point, prostrate, irregularly branched; each cell produced above into a rigid, inarticulate bristle.

Order 16. ULVACEÆ. *Green, or rarely purple, marine or fresh-water Algæ, composed of small polygonal cells, forming expanded membranes, or membranous tubes; very rarely arranged in filaments.*

XCV. ENTEROMORPHA. *Frond* tubular.

XCVI. ULVA. *Frond* flat, green.

XCVII. PORPHYRA. *Frond* flat, purple.

XCVIII. BANGIA. *Frond* filiform (mostly), purple or pink.

Order 17. OSCILLATORIACEÆ. *Green or blue, rarely purple, marine or (more frequently) fresh-water Algæ, composed of continuous, tubular, simple, or rarely branching filaments, which are either free or invested with gelatine. Endochrome annulated, at length separating into lenticular sporidia.*

Sub-order 1. RIVULARIÆ. *Filaments* united together into a solid gelatinous or cartilaginous frond.

XCIX. RIVULARIA. *Filaments* not sheathed.

C. SCHIZOSIPHON. *Filaments* sheathed; the sheath multifid.

Sub-order 2. OSCILLATORIÆ. *Filaments* tufted or stratified, free.

CI. SCHIZOTHRIX. *Filaments* rigid, in branching bundles, at length splitting.

CII. CALOTHRIX. *Filaments* short, tufted, fixed at the base only.

CIII. LYNGBYA. *Filaments* elongate, decumbent, flaccid.

CIV. MICROCOLEUS. *Filaments* needle-shaped, several enclosed together in membranous or gelatinous sheaths.

CV. OSCILLATORIA. *Filaments* needle-shaped, straight, or slightly curved, short, heaped together in gelatinous strata, oscillating.

CVI. SPIRULINA. *Filaments* spirally twisted, lying in a mucous stratum, vividly oscillating.

Order 18. NOSTOCHACEÆ. *Green, fresh-water or rarely marine Algæ, composed of moniliform filaments, lying in a gelatinous matrix. Cells globose or oval.*

CVII. MONORMIA. A single filament enclosed in a convoluted gelatinous and branching frond.

CVIII. SPHÆROZYGA. *Filaments* free, separate, naked.

CIX. SPERMOSIRA. *Filaments* free, separate; each enclosed in a very delicate, membranous, filiform tube.

Order 19. PALMELLACEÆ.

Sub-order. HORMOSPOREÆ. Cells contained in confervoid, simple or branching tubular filaments.

CX. HORMOSPORA.

SYNOPSIS OF THE SPECIES.

I. MELANOSPERMEÆ.

Order 1. FUCACEÆ.

I. SARGASSUM.

1. **vulgare**; stem filiform, alternately branched; leaves lanceolate, serrated, strongly ribbed, glandular; air-vessels on compressed stalks, spherical, pointless; receptacles axillary, unarmed. (TAB. CCCXLIII.)
2. **bacciferum**; leaves linear-lanceolate, very narrow, without pores; air-vessels spherical, mucronate. (TAB. CIX.)

II. HALIDRYS.

3. **siliquosa**; branches linear; air-vessels compressed, linear-lanceolate, slightly constricted at the septa, mucronate. (TAB. LXVI.)

III. CYSTOSEIRA.

4. **ericoides**; stem short, bearing numerous decompound branches, which are densely clothed with short, spine-like ramuli; air-vessels small, solitary; receptacles armed. (TAB. CCLXV.)
5. **granulata**; branches bulbous at the base; receptacles elongate, without mucro. (TAB. LX.)
6. **barbata**; branches bulbous at the base; receptacles short, mucronate. (TAB. CCCLX.)
7. **fœniculacea**; branches slender, rough with hard points, repeatedly dichotomo-pinnate; air-vessels small, one or two together; receptacles minute, smooth, linear-lanceolate. (TAB. CXXII.)
8. **fibrosa**; branches slender, bi-tri-pinnate; pinnules set with setaceous ramuli; vesicles elliptical, solitary or in pairs; receptacles very long, set with spine-like processes. (TAB. CXXXIII.)

IV. PYCNOPHYCUS.

9. **tuberculatus**. (TAB. LXXXIX.)

V. FUCUS.

10. **vesiculosus**; frond flat, midribbed, dichotomous, entire; air-vessels in pairs or absent; receptacles turgid, terminal. (TAB. CCIV.)
11. **ceranoides**; frond plane, coriaceous-membranaceous, entire, midribbed, without vesicles, dichotomous, with lateral narrow, dichotomous, fastigate, fertile branches. (TAB. CCLXXI.)
12. **serratus**; frond flat, midribbed, serrated, without air-vessels. (TAB. XLVII.)

13. **nodosus**; frond compressed, dichotomo-pinnate; branches strap-shaped, attenuated at the base, remotely toothed and here and there swelling into oblong air-vessels, wider than the frond; receptacles lateral, ovate, stalked. (TAB. CLVIII.)
14. **Mackaii**; cylindrical or compressed, dichotomous; air-vessels elliptical, solitary; receptacles lateral, stalked, pendulous, near the base of the dichotomous branches. (TAB. LII.)
15. **canaliculatus**; frond narrow, channelled, without midrib or air-vessels, dichotomous. (TAB. CCXXIX.)

VI. HIMANTHALIA.

16. **lorea**; frond top-shaped; receptacles repeatedly forked. (TAB. LXXVIII.)

Order 2. SPOROCHNACEÆ.

VII. DESMARESTIA.

17. **ligulata**; flat, obscurely midribbed, repeatedly pinnate; pinnæ and pin-nulæ opposite, lanceolate. (TAB. CXV.)
18. **aculeata**; branches compressed, slender, bi-tri-pinnate; pinnæ and pin-nulæ alternate, margined with subulate spines. (TAB. XLIX.)
19. **viridis**; frond filiform, repeatedly pinnate; pinnæ and pinnulæ capillary, exactly opposite, patent. (TAB. CCCXII.)

VIII. ARTHROCLADIA.

20. **villosa**. (TAB. LXIV.)

IX. SPOROCHNUS.

21. **pedunculatus**; stem undivided; branches lateral, simple; receptacles ellip-tical. (TAB. LVI.)

X. CARPOMITRA.

22. **Cabrerae**; irregularly dichotomous, linear, narrow, flat, midribbed; branches here and there constricted. (TAB. XIV.)

Order 3. LAMINARIACEÆ.

XI. ALARIA.

23. **esculenta**; frond lanceolate; midrib narrow, cylindrical; leaflets linear-oblong or wedge-form. (TAB. LXXIX.)

XII. LAMINARIA.

24. **digitata**; stipe cylindrical or compressed, elongate; lamina deeply cleft into many linear segments. (TAB. CCXXIII.)
24.* Var. *stenophylla*, TAB. CCCXXXVIII.
25. **bulbosa**; stipes flat, with a wavy margin, twisted at the base, rising from a hollow, warted tuber; frond deeply cleft into linear segments. (TAB. CCXLI.)
26. **longicruris**; stipes very long, slender at the base, hollow and inflated in the middle, tapering to the apex; lamina undivided, membranaceous, oblong. (TAB. CCCXXXIX.)

27. **saccharina**; stem filiform, solid, expanding into a cartilagineo-coriaceous, lanceolate frond. (TAB. CCLXXXIX.)
28. **Phyllitis**; stipe short, subcompressed, gradually expanding into a linear-lanceolate, delicately membranous, undivided frond. (TAB. CXCH.)
29. **Fascia**; stipe very short, setaceous, ending in a membranaceous, wedge-shaped or lanceolate frond. (TAB. XLV.)

XIII. CHORDA.

30. **filum**; frond filiform, very long, not constricted at the joints. (TAB. CVII.)
31. **lomentaria**; frond membranous, constricted at distant intervals, the interstices inflated. (TAB. CCLXXXV.)

Order 4. DICTYOTACEÆ.

XIV. CUTLERIA.

32. **multifida**; polymorphous, flabelliform, irregularly cleft; laciniae acute, attenuate. (TAB. LXXV.)

XV. HALISERIS.

33. **polypodioides**; frond dichotomous, entire; spots of fructification linear, disposed along the midrib. (TAB. XIX.)

XVI. PADINA.

34. **Pavonia**. (TAB. XCI.)

XVII. ZONARIA.

35. **collaris**; procumbent, coriaceous, attached by the under surface; upper surface emitting cup-shaped, membranaceous, orbicular fronds, fringed round the margin. (TAB. CCCLIX.)
36. **parvula**; procumbent, attached by fibres from the lower surface, membranaceous, variously lobed; lobes free, rounded. (TAB. CCCXLI.)

XVIII. TAONIA.

37. **atomaria**; frond broadly wedge-shaped, deeply and irregularly cleft longitudinally; spores in wavy transverse lines, with intermediate scattered spores. (TAB. I. *Dictyota atomaria*.)

XIX. DICTYOTA.

38. **dichotoma**; frond regularly dichotomous, the upper segments narrower. (TAB. CIII.)

XX. STILOPHORA.

39. **rhizodes**; subsolid, much and irregularly branched; the lesser divisions dichotomous, attenuated; wart-like fructification densely covering the branches and ramuli. (TAB. LXX.)
40. **Lyngbyæi**; frond tubular, distended, dichotomous, with rounded axils, much attenuated upwards; ramuli forked, capillary; sori subdistant, in transverse lines. (TAB. CCXXXVII.)

XXI. DICTYOSIPHON.

41. **foeniculaceus**. (TAB. CCCXXVI.)

XXII. STRIARIA.

42. **attenuata**; branches and ramuli mostly opposite, tapering to each extremity. (TAB. XXV.)

XXIII. PUNCTARIA.

43. **latifolia**; oblong or obovate, pale green, blunt, suddenly tapering at the base into a minute stipe. (TAB. VIII.)
 44. **plantaginea**; frond brownish-olive, cuneate at the base. (TAB. CXXVIII.)
 45. **tenuissima**; frond sublinear, very thin and transparent. (TAB. CCXLVIII.)

XXIV. ASPEROCOCCUS.

46. **compressus**; frond compressed, flat, linear-lanceolate, obtuse; sori oblong. (TAB. LXXII.)
 47. **Turneri**; stipe filiform, suddenly expanding into an inflated, obtuse, delicately membranaceous, bag-like frond. (TAB. XI.)
 48. **echinatus**; cylindrical or clavate, much attenuated at the base. (TAB. CXCIV.)

XXV. LITOSIPHON.

49. **pusillus**; fronds filiform, very long, clothed with pellucid hairs; spores scattered. (TAB. CCLXX.)
 50. **Laminariæ**; fronds short, stellately tufted, smooth, transversely banded, bands close together; spores scattered. (TAB. CCXCV.)

Order 5. CHORDARIACEÆ.

XXVI. CHORDARIA.

51. **flagelliformis**; branches lateral, subsimple, filiform, naked; peripheric filaments club-shaped. (TAB. CXI.)
 52. **divaricata**; irregularly divided; branches subdichotomous, flexuous, having short, very patent, forked, scattered ramuli; peripheric filaments capitate. (TAB. XVII.)

XXVII. MESOGLOIA.

53. **vermicularis**; frond unequally distended, clumsy; branches irregularly pinnate, worm-like, thickened in the middle; ramuli copious. (TAB. XXXI.)
 54. **Griffithsiana**; frond slender, equal; branches scattered, filiform, long, simple, nearly bare. (TAB. CCCXVIII.)
 55. **virescens**; frond filiform, gelatinous; branches long, slender, villous; ramuli numerous, patent, short, linear, obtuse. (TAB. LXXXII.)

XXVIII. LEATHESIA.

56. **tuberiformis**; fronds at first stuffed with cottony fibres, at length hollow. (TAB. CCCXXIV.)
 57. **Berkeleyi**; dark brown, depressed, solid. (TAB. CLXXVI.)

XXIX. RALFSIA.

58. **verrucosa**, Aresch.; frond orbicular, adhering by its whole under surface, warted in the middle. (TAB. XCVIII. *R. deusta*.)
 (*Ralfsia deusta*, J. Ag., founded on the original *Zonaria deusta* of Agardh, is a different species.)

XXX. ELACHISTA.*

59. **fucicola**; tufts pencilled; filaments long, attenuated upwards; articulations once or twice as long as broad. (TAB. CCXL.)
60. **flaccida**; tufts pencilled; filaments long, flaccid, much attenuated at the base, the lower articulations half as long as broad, the upper of equal length and breadth. (TAB. CCLX.)
61. **curta**; filaments very short, club-shaped, rather rigid, rising from a tubercle; articulations as long as broad; spores pear-shaped. (TAB. CCCXXXII.)
62. **stellulata**; tufts very minute, stellate; filaments tapering at the base, slightly clavate, obtuse; articulations twice as long as broad, uniform. (TAB. CCLXI.)
63. **scutulata**; filaments short, rising from an oblong, convex, shield-like tubercle, composed of densely packed, dichotomous fibres; articulations 2-3 times as long as broad; spores oblong. (TAB. CCCXXIII.)
64. **pulvinata**; tufts very minute, globose; filaments much tapered to both ends, the basal joints 3-4 times, the middle $1\frac{1}{2}$, the apical as long as broad. (TAB. XXVIII. A. *E. attenuata*.)
65. **velutina**; spreading in thin, indefinite velvety patches; filaments very minute, filiform; spores elliptical, pedicellate. (TAB. XXVIII. B.)

XXXI. MYRIONEMA.

66. **strangulans**; patches convex, confluent; vertical filaments clavate, densely set; spores obovate, on short stalks, rising from the decumbent filaments. (TAB. CCLXXX.)
67. **Leclancherii**; patches orbicular, thin at the edges, convex in the centre; spores on long pedicels. (TAB. XLI. A.)
68. **punctiforme**; patches globose; spores affixed to the vertical filaments, near their base. (TAB. XLI. B.)
69. **clavatum**; very minute, rather convex; filaments clavate, mostly bifid; spores obovate, pedicellate, affixed to the filaments. (TAB. CCCXLVIII.)

Order 6. ECTOCARPACEÆ.

XXXII. CLADOSTEPHUS.

70. **verticillatus**; branches slender; ramuli mostly forked, subdistant, regularly whorled. (TAB. XXXIII.)
71. **spongiosus**; branches thick and clumsy; ramuli mostly simple, irregularly whorled and densely imbricated. (TAB. CXXXVIII.)

XXXIII. SPHACELARIA.

72. **flicina**; shaggy at the base; stem slender, irregularly divided; branches lanceolate, erecto-patent, bi-tri-pinnate; pinnæ erect; pinnules multifid; all the axils very acute and narrow. (TAB. CXLII.)
73. **Sertularia**; slightly shaggy at the base; stem weak and slender, irregularly divided; branches linear, horizontally patent, tripinnate; pinnæ divaricate; pinnules multifid; all the axils very obtuse and wide. (TAB. CXLIII.)
74. **scoparia**; coarse and of large size, shaggy at the base; upper branches once or twice pinnated; pinnæ erecto-patent, awl-shaped, the lower ones pinnulate. (TAB. XXXVII.)

* Incorrectly spelt *Elachistea* in the body of the work.

75. **plumosa**; filaments naked at the base, long, irregularly divided, inarticulate; branches pectinato-pinnate; pinnae opposite, closely set, simple. (TAB. LXXXVII.)
76. **cirrhopa**; parasitical, naked at the base; filaments short, densely tufted, jointed throughout, simple or divided; branches pinnate; pinnae opposite or irregular, of unequal length. (TAB. CLXXVIII.)
77. **fusca**; densely tufted, capillary, distantly and irregularly branched; branches very erect, subsimple; ramuli few, scattered, club-shaped or three-pronged; articulations twice as long as broad. (TAB. CXLIX.)
78. **radicans**; filaments erect, or decumbent and rooting, sparingly branched; branches simple, scattered, erect, naked; spores clustered, sessile, globose. (TAB. CLXXXIX.)
79. **racemosa**; spores pedunculate, in compound racemose, lateral clusters. (TAB. CCCXLIX.)

XXXIV. ECTOCARPUS.

80. **siliculosus**; tufts soft, yellowish-olive; filaments very slender, excessively branched; ultimate branchlets alternate; propagula stalked, subulate, attenuate to a fine point. (TAB. CLXII.)
81. **amphibius**; tufts short, soft, pale olive; filaments subdichotomous; ramuli scattered, subulate; articulations twice or thrice as long as broad; propagula linear-attenuate, mostly sessile. (TAB. CLXXXIII.)
82. **fenestratus**; pale olive-green, very slender, in small tufts; branches alternately and laxly decompose; articulations twice or thrice as long as broad; propagula stalked, at first clavate, afterwards elliptic-oblong, obtuse. (TAB. CCLVII.)
83. **fasciculatus**; tufts olivaceous, dense; branches set with alternate or secund fascicles of minute, secund ramuli; propagula sessile, secund, close together, ovate-acuminate or subulate. (TAB. CCLXXIII.)
84. **Hincksiae**; tufted; filaments irregularly branched; branches flexuous, set with secund ramuli which are pectinated along their upper side; utricles conical, lining the inner face of the ultimate ramuli. (TAB. XXII.)
85. **tomentosus**; filaments interwoven into a sponge-like, branching frond; ramuli few; propagula stalked, linear-oblong or fusiform, obtuse. (TAB. CLXXXII.)
86. **crinitus**; filaments long, decumbent, stratified, sparingly branched; branches subsimple, distant; ramuli few, patent; spores globose, scattered, sessile; articulations twice or thrice as long as broad. (TAB. CCCXXX.)
87. **pusillus**; filaments tufted, interwoven, sparingly branched; branches distant, patent; ramuli few, divaricating; spores roundish-oblong, subsessile, frequently opposite. (TAB. CLIII.)
88. **distortus**; filaments densely matted, angularly bent, flaccid and fragile; branches divaricated, alternate or secund; ramuli horizontally patent, recurved, obtuse; spores obovate, subsessile. (TAB. CCCXXIX.)
89. **Landsburgii**; tufts intricate, small; filaments tenacious, zigzag, divaricately much branched; branches bristling with spine-like horizontal ramuli; articulations shorter than broad; dissepiments very narrow. (TAB. CCXXXIII.)
90. **littoralis**; tufts dense, interwoven, olive-brown; filaments coarse, much branched; ultimate branchlets patent, alternate or opposite; propagula forming oblong swellings in the branches. (TAB. CXC VII.)

91. **longifructus**; tufts large and feathery; filaments robust, excessively branched, decompound; branches mostly opposite, with short, spine-like ramuli; articulations as long as broad; propagula very long, linear-lanceolate, terminating the branches and ramuli. (TAB. CCLVIII.)
92. **granulosus**; olive, robust, slightly entangled; branches free, repeatedly divided; lesser branches and ramuli opposite, spreading; spores elliptical, dark-coloured, sessile. (TAB. CC.)
93. **sphærophorus**; filaments densely tufted, much branched; upper branches patent, opposite or in fours, having opposite, patent ramuli; spores globose, sessile, opposite one to the other, or to a branchlet. (TAB. CXXVI.)
94. **brachiatus**; branches opposite or quaternate, spreading; ramuli opposite, patent; propagula forming oblong swellings in the nodes of the lesser branches. (TAB. IV.)
95. **Mertensii**; distichous; branches opposite, of unequal length, closely set with short, slender, opposite ramuli; spores binate, immersed in the ramuli. (TAB. CXXXII.)

XXXV. MYRIOTRICHIA.

96. **clavæformis**; frond clavate; ramuli gradually longer upwards. (TAB. CI.)
97. **filiformis**; filiform, slender, beset at irregular intervals with oblong clusters of short ramuli. (TAB. CLVI.)

II. RHODOSPERMEÆ.

Order 7. RHODOMELACEÆ.

XXXVI. ODONTHALIA.

98. **dentata**; frond irregularly pinnate; branches deeply pinnatifid; laciniae alternate, sharply toothed toward their truncate extremities. (TAB. XXXIV.)
(*The colour on the plate is incorrect. This plant is of a deep blood-red colour when growing, but becomes dark on exposure to the air.*)

XXXVII. RHODOMELA.

99. **lycopodioides**; divided near the base into several, long, simple branches, which are densely set with multifid, slender ramuli. (TAB. L.)
100. **subfusca**; much branched; branches irregularly decompound, and clothed with pinnated branchlets mixed with scattered subulate ramuli; pinnules subulate. (TAB. CCLXIV.)

XXXVIII. BOSTRYCHIA.

101. **scorpioides**; frond flexuous, forked; branches bi-tri-pinnate; pinnæ and pinnulæ patent; apices strongly rolled inwards. (TAB. XLVIII.)

XXXIX. RYTIPHLÆA.

102. **pinastroides**; frond terete; lesser branches pectinato-pinnate, the pinnæ secund, with their tips inflexed. (TAB. LXXXV.)
103. **complanata**; brown-red, compressed, pinnate or bi-tri-pinnate; pinnules subulate, erect; axils very acute. (TAB. CLXX.)
104. **thuyoides**; stems terete, erect, alternately branched; branches erect, vir-

gate, pinnulate or bipinnulate, the pinnules short; capsules sessile. (TAB. CCXXI.)

105. **fruticulosa**; stems terete, diffuse, branched from the base; branches divaricating, pinnato-dichotomous, with short multifid ramuli; axils rounded; capsules sessile. (TAB. CCXX.)

XL. POLYSIPHONIA.

* *Primary tubes 4-5; frond distinctly jointed throughout.*

106. **urceolata**; rigid, setaceous, full-red, loosely bundled; branches dichotomous, with scattered patent or reflexed ramuli; articulations 3-5 times as long as broad; dissepiments pellucid; capsules pitcher-shaped, constricted at the mouth. (TAB. CLXVII.)

107. **formosa**; flaccid, exceedingly slender, full red, densely tufted; branches dichotomous, with scattered, patent ramuli; articulations 5-10 times as long as broad; dissepiments pellucid; capsules pitcher-shaped, constricted at the mouth. (TAB. CLXVIII.)

(*P. stricta*, Harv. Man. p. 83, seems to be the young of this species?)

108. **pulvinata**; densely tufted; filaments creeping, throwing up erect, irregularly dichotomous stems, whose branches bear a few short, recurved ramuli; articulations 3-4 times as long as broad; capsules urn-shaped, stalked. (TAB. CII. B.)

109. **fibrata**; setaceous below, attenuated and capillary above, flaccid, gelatinous, alternately branched, with dichotomous, pencilled lesser branches, whose tips are remarkably fibrilliferous; axils patent; articulations of the branches 4-6 times longer than broad; capsules ovate, stalked. (TAB. CCVIII.)

110. **spinulosa**; articulate throughout; rigid, branched from the base, branches divaricate, decompound; ramuli short, spine-like, spreading; articulations as long as broad, three-striate. (TAB. CCCXX.)

111. **Richardsoni**; stem cartilaginous, setaceous; branches alternate, long, divaricated, set above with very patent, straight, forked ramuli; articulations 2-3 times longer than broad, veiny; tubes 5; capsules sessile, broadly ovate. (TAB. X.)

112. **Griffithsiana**; stem alternately branched, rigid; branches subsimple, with dichotomous or alternately multifid pencilled, slender ramuli; articulations once and half as long as broad, 3-4-striate; siphons four primary, with four external, secondary; capsules sessile. (TAB. CCXXVIII.)

113. **elongella**; setaceous, rigid below, flaccid above, dichotomous, with very patent axils; upper branches decomposed into multifid, pencilled, rose-red ramuli; articulations about as long as broad, 2-3-striate, the tubes very wide and dissepiments pellucid; capsules ovate, stalked. (TAB. CXLVI.)

* * *Primary tubes 4; stem and branches subopake, or inarticulate.*

114. **elongata**; robust, cartilaginous, irregularly divided; ramuli pencilled, capillary, multifid, attenuated at base and apex; articulations once and half as long as broad, those of the stem and branches reticulated with veins; siphons four. (TAB. CCXCII. and CCXCIII.)

115. **violacea**; brown-red, purple, or sanguineous; stem inarticulate, veiny, robust, alternately branched; branches decompound, feathery, the ultimate ramuli very slender, multifid, fibrilliferous; articulations of the ramuli two-striate, 2-4 times as long as broad; capsules ovate. (TAB. CCIX.)

(*P. Grevillii*, Harv. Man. ed. 2. p. 86, I now consider to be merely a variety of this species, more sanguineous than usual.)

116. **Carmichaeliana**; stem inarticulate, percurrent, flexuous, rigid; branches lateral, divaricating; ramuli scattered, very patent, spinoso-multifid, articulate; articulations as long as broad, three-striate. (TAB. CCCXIX.)
117. **fibrillosa**; pale straw-colour or brown; stems inarticulate, marked with sinuous veins, robust, much branched; branches articulated near the apices only, beset with slender, finely divided, articulated ramuli; tips copiously fibrillose; articulations rather longer than their breadth; siphons four. (TAB. CCCII.)

* * * *Primary tubes 7; stem inarticulate.*

118. **Brodiaei**; stems inarticulate, robust; branches virgate, clothed with pencilled, multifid, flaccid, articulated ramuli; articulations of the ramuli 3-4-striate, longer than broad; siphons seven; capsules ovate, pedicellate. (TAB. CXCV.)

* * * * *Primary tubes 6-7; frond jointed throughout.*

119. **variegata**; brownish-purple, setaceous, rigid below, flaccid and capillary above, dichotomous, the lower axils patent; branches decompound; lower articulations very short, middle twice as long as broad, each marked with three broad, oblong cells, separated by pellucid spaces; siphons 6-7; capsules ovate, stalked. (TAB. CLV.)

* * * * * *Primary tubes 8-20; frond jointed throughout.*

120. **obscura**; densely matted, short; filaments creeping, throwing up erect, simple, secund branches; articulations short. (TAB. CII. A.)
121. **simulans**; slender, bushy, branched from the base; branches patent, decompoundly but irregularly pinnate; ramuli subulate; articulations once and half as long as broad; siphons about twelve; capsules ovate, sessile. (TAB. CCLXXVIII.)
122. **nigrescens**; robust, rigid, and rough with broken branches below, much branched and flaccid above; branches decompoundly pinnate; ramuli subulate; lower articulations short, upper once and half as long as broad; siphons about twenty; capsules sessile, ovate. (TAB. CCLXXVII.)
123. **affinis**; filaments elongate, rigid below, flaccid above; branches naked at the base, multifid and decompound pinnate above; ramuli very erect, subulate; articulations multistriate, the lower 2-3 times as long as broad, upper gradually shorter; siphons about sixteen. (TAB. CCCIII.)
124. **subulifera**; setaceous, flexuous, irregularly much branched; branches alternately decompound, spreading, the lesser divisions virgate; ramuli scattered, subulate, patent; siphons about thirteen. (TAB. CCXXVII.)
125. **atrorubescens**; setaceous, dark brownish-red, rigid, alternately branched; branches long, very erect, once or twice compounded; ramuli scattered, tapering to base and apex, simple or divided; articulations of stem 2-3 times as long as broad, of branches shorter, many-striate, the striæ curved; siphons about twelve; capsules broadly ovate. (TAB. CLXXII.)
126. **furcellata**; filaments elongated, flexuous, dichotomous; axils broad, rounded; ramuli multifid; articulations 3-5 times longer than broad. (TAB. VII.)
127. **fastigiata**; rigid, setaceous, dichotomous, fastigiate; articulations shorter than their breadth; siphons 16-18. (TAB. CCXCIX.)

128. **parasitica**; distichous, rigid, slender, full red, bi-tri-pinnate; pinnules closely set, alternate, subulate, acute; articulations about as long as broad, each marked with 3 or 4 broad, hexagonal cells, separated by pellucid spaces; capsules ovate, stalked. (TAB. CXLVII.)
129. **byssoides**; stems rigid, setaceous, distichously pinnate; branches patent, decompound, clothed with dichotomous single-tubed byssoid ramelli; articulations variable in length; siphons seven. (TAB. CCLXXXIV.)

XLI. **DASYA.**

130. **coccinea**; stems robust, rough with hair-like fibres, distichous; branches bi-tri-pinnate; pinnæ multifid, single-tubed, their articulations as long as broad. (TAB. CCLIII.)
131. **ocellata**; stems subsimple; ramelli quadrifarious, dichotomous, erecto-patent; stichidia linear-lanceolate, tapering to a point. (TAB. XL.)
132. **Arbuscula**; irregularly much branched; ramelli quadrifarious, dichotomous, patent or divaricate, scarcely attenuated; articulations 2-4 times as long as broad; stichidia elliptic-oblong, mucronate; capsules urceolate, with a long cylindrical neck. (TAB. CCXXIV.)
133. **venusta**; decompoundly pinnate; ramelli quadrifarious, exceedingly slender, many times dichotomous, much attenuated; articulations 5-6 times as long as broad; stichidia pedicellate, ovoid, much acuminate; capsules ovate-urceolate. (TAB. CCXXV.)

Order 8. LAURENCIACEÆ.

XLII. **BONNEMAISONIA.**

134. **asparagoides**; frond compressed; capsules stalked, opposite the cilia. (TAB. LI.)

XLIII. **LAURENCIA.**

135. **pinnatifida**; frond compressed, bi-tri-pinnate, the divisions alternate; ramuli linear, erecto-patent, simple or lobed. (TAB. LV.)
136. **cæspitosa**; cylindrical or subcompressed, narrow, repeatedly pinnate, pyramidal; branches and ramuli erecto-patent, scattered, distichous or spreading on all sides, truncate, scarcely tapering at the base. (TAB. CCLXXXVI.)
137. **obtusa**; cylindrical, repeatedly pinnate; branches patent; pinnæ and pinulæ mostly opposite, the ultimate pinnules very short and obtuse. (TAB. CXLVIII.)
138. **dasyphylla**; cylindrical, decompoundly pinnate or irregularly branched; branches erecto-patent; ramuli much attenuated at the base, scattered, very obtuse. (TAB. CLII.)
139. **tenuissima**; frond terete; branches long and virgate, clothed with very slender, short ramuli, which taper at each end. (TAB. CXCVIII.)

XLIV. **CHRYSYMENIA.**

140. **clavellosa**; repeatedly pinnate; ramuli lanceolate, attenuate. (TAB. CXIV.)
141. **rosea**; pinnate or bipinnate; branches elliptic-oblong, compressed; pinnæ opposite, blunt. (TAB. CCCI. and TAB. CCCLVIII. A.)

XLV. **CHYLOCLADIA.**

142. **ovalis**; frond terete, branching, solid; branches clothed with simple, elliptical, jointed, tubular ramuli; capsules spherical. (TAB. CXVIII.)

143. **kaliformis**; pyramidal, erect, with a leading stem, which is distended, constricted at distant intervals, and whorled with articulato-constricted branches; ramuli opposite or whorled, moniliform; capsules globose. (TAB. CXLV.)
144. **reflexa**; dull purple; lower branches cylindrical, arched, attaching themselves by discs; secondary branches moniliform, spindle-shaped; ramuli few, scattered; capsules globose. (TAB. XLII.)
145. **parvula**; slender, irregularly branched; ramuli scattered; branches constricted at short intervals; capsules conical, with a prominent orifice. (TAB. CCX.)
146. **articulata**; frond tubular, strongly constricted throughout as if jointed, much branched, di-trichotomous, fastigate; the upper branches often crowded; capsules obtusely conical. (TAB. CCLXXXIII.)

Order 9. CORALLINACEÆ.

XLVI. CORALLINA.

147. **officinalis**; upper articulations slightly obconical, round-edged, their upper angles blunt. (TAB. CCXXII.)
148. (**elongata**; "the lateral shoots of the branches slender and subulate, with long, cylindrical articulations."—*Johnst. Lith.* p. 221.)
I have seen no specimen of this, and have consequently been obliged to omit figuring it.
149. **squamata**; upper articulations obconical or obcordate, compressed, two-edged, their upper angles sharp and prominent. (TAB. CCI.)

XLVII. JANIA.

150. **rubens**; articulations cylindrical, unarmed, about four times as long as broad. (TAB. CCLII.)
151. **corniculata**; articulations of the branches obconical, compressed, their upper angles sharp and prominent. (TAB. CCXXXIV.)

XLVIII. MELOBESIA.

* *Frond thick and stony, branched or incrusting.*

152. **polymorpha**; attached to rocks, encrusting, thick; the surface smooth or tuberculated; ceramidia minute, depressed. (TAB. CCCXLV.)
153. **calcareæ**; unattached, shrub-like, much branched; branches slender, spreading, tapering to a blunt point. (TAB. CCXCI.)
154. **fasciculata**; frond unattached, roundish or lobed, stony, much branched, fastigate; branches solid, short, thick and crowded; apices depressed. (TAB. LXXIV.)

** *Frond thin, foliated, free or partially attached to rocks.*

155. **agariciformis**; frond unattached, globular, hollow; foliations papery, erect, lobed and sinuated. (TAB. LXXIII.)
156. **lichenoides**; attached to rocks, free at the margins, foliaceous, variously lobed; foliations spreading, imbricated; ceramidia conical, prominent. (TAB. CCCXLVI.)

*** *Frond minute, parasitic.*

157. **membranacea**; minute, dot-like, very thin, at length confluent; ceramidia one or two, depressed. (TAB. CCCXLVII. A.)

158. **farinosa**; minute, irregular in outline, rather thin, pallid, with 2-3 prominent ceramidia. (TAB. CCCXLVII. B.)
159. **verrucata**; thin, expanded, irregularly lobed, pallid, dotted over with minute, pimply ceramidia. (TAB. CCCXLVII. C.)
160. **pustulata**; thick, dull purple or green, oblong, incrusting; ceramidia numerous, large, prominent, conical. (TAB. CCCXLVII. D.)

XLIX. HILDENBRANDTIA.

161. **rubra**. (TAB. CCL.)

L. HAPALIDIUM.

162. **Phyllactidium**, Kütz.; flabelliform, variously lobed, colourless. (*Lithocystis Allmanni*, TAB. CLXVI.)

Common on Algæ round the British coasts; and, according to Kützing, found abundantly in the Mediterranean and in New Holland. Our figure represents the young plant, which afterwards becomes much more lobed and expanded.

Order 10. DELESSERIACEÆ.

LI. DELESSERIA.

163. **sanguinea**; stem short, cartilaginous, bearing oblong, transversely veined, entire, undulate leaves; veinlets opposite. (TAB. CLI.)
164. **sinuosa**; stem branched, bearing oblong or ovate, deeply sinuate or pinatifid, toothed, pennate-ribbed leaves; nerves opposite. (TAB. CCLIX.)
165. **alata**; stem dichotomous, decompoundly branched, winged throughout with a narrow, membranous, pennate-nerved lamina. (TAB. CCXLVII.)
166. **angustissima**; frond very narrow, compressed, two-edged, distichously much branched, destitute of membrane. (TAB. LXXXIII.)
167. **Hypoglossum**; frond linear-lanceolate, repeatedly proliferous from the midrib with leaflets of similar form; leaflets acute. (TAB. II.)
168. **ruscifolia**; frond linear-oblong, repeatedly proliferous from the midrib with leaflets of similar form; leaflets round at the apex. (TAB. XXVI.)

LII. NITOPHYLLUM.

169. **punctatum**; frond very thin and delicate, nerveless, more or less regularly dichotomous, rose-red; axils rounded; sori large, oblong, scattered over the whole surface. (TAB. CCII. and CCIII.)
170. **Hilliae**; frond thickish, veiny toward the base, roundish, irregularly cleft; segments oblong, obtuse; sori very minute, dot-like, densely scattered over the surface of the frond. (TAB. CLXIX.)
171. **Bonnemaisoni**; frond shortly stalked, fan-shaped, variously cleft; segments wedge-shaped; spots of granules minute, roundish, scattered over the surface. (TAB. XXIII.)
172. **Gmelini**; frond crisp, stipitate, veined at the base, fan-shaped, vaguely cleft; segments broadly wedge-shaped, waved, and curled; sori linear, marginal. (TAB. CCXXXV.)
173. **laceratum**; frond sessile, rigidly membranous, traversed by branching veinlets, dichotomous; segments linear or cuneate, waved at the margin, obtuse; sori oblong, marginal. (TAB. CCLXVII.)

174. **versicolor**; stipitate; frond fan-shaped, circumscribed, subdichotomous or irregularly cleft, veinless, incrassated at the base; segments rounded. (TAB. IX.)

LIII. PLOCAMIUM.

175. **coccineum**; frond narrow, plano-compressed; ramuli subulate, secund, 3 or 4 consecutively; pectinate on their inner edges. (TAB. XLIV.)

Order 11. RHODYMENIACEÆ.

LIV. STENOGRAMME.

176. **interrupta**; stipitate, membranaceous, flabelliform, dichotomously cleft; apices obtuse; conceptacles forming a nerve-like line through the centre of each lobe. (TAB. CLVII.)

LV. RHODYMENIA.

177. **bifida**; thin and semitransparent, dichotomous; segments linear or cuneate; apices obtuse; tubercles mostly marginal, sessile; tetraspores transversely zoned. (TAB. XXXII.)
178. **laciniata**; frond thickish, subopake, bright red, flabelliform, deeply cleft; segments wedge-shaped, obtuse; margin curled and fringed with minute processes in which the tubercles are imbedded. (TAB. CXXI.)
179. **Palmetta**; stipes cylindrical, elongate, expanding into a fan-shaped, rose-red, dichotomously cleft frond; segments linear, with rounded interstices; margin entire, flat; tubercles sessile, marginal or scattered; sori elliptical, solitary in the expanded apices. (TAB. CXXXIV.)
180. **cristata**; fan-shaped, membranaceous, deeply laciniate; segments dilated upwards, repeatedly divided; lesser divisions laciniate at the ends and often fimbriate; tubercles spherical, marginal, sessile. (TAB. CCCVII.)
181. **ciliata**; frond thick, subopake, dull purplish-red, shortly stipitate, lanceolate or forked, irregularly pinnated with lanceolate or bifid segments; margin fringed with subulate processes, in which tubercles are imbedded. (TAB. CXXVII.)
182. **jubata**; frond thickish, flaccid, dull red, linear-lanceolate, cirrhose at the apex, pinnatifid; margin and often the disc beset with filiform processes. (TAB. CLXXV.)
183. **palmata**; frond coriaceous or membranaceous, dull purple, broadly wedge-shaped, irregularly cleft, palmate or dichotomous, sometimes laciniate, and very narrow; margin flat and even, simple or winged with leaflets; sori cloud-like, dispersed. (TAB. CCXVII. and CCXVIII.)

LVI. SPHÆROCOCCLUS.

184. **coronopifolius**; much branched; branches alternate or subdichotomous, multifid; laciniae acute, fringed with cilia; tubercles in the marginal cilia. (TAB. LXI.)

LVII. GRACILARIA.

185. **multipartita**; frond flat, tender, purplish-red, deeply cleft, irregularly dichotomous or fingered; branches linear-wedge-shaped; tubercles conical, very prominent, scattered plentifully over the segments. (TAB. XV.)
186. **compressa**; frond succulent, brittle, subcompressed, irregularly branched; branches long, tapering; tubercles prominent, ovate, scattered. (TAB. CCV.)

187. **confervoides**; frond filiform, cartilaginous, irregularly branched or sub-simple; branches elongate, slender; tubercles scattered, sessile, roundish, subacute. (TAB. LXV.)
188. **erecta**; fronds many from a common disc, short, erect, filiform, sparingly branched; tubercles globose, clustered; tetraspores contained in terminal, lanceolate, pod-like ramuli. (TAB. CLXXVII.)

LVIII. HYPNEA.

189. **purpurascens**; purplish-red, excessively branched, bushy; branches alternate; ramuli multifid, attenuate; tubercles immersed in the ramuli. (TAB. CXVI.)

Order 12. CRYPTONEMIACEÆ.

LIX. GRATELOUPIA.

190. **flicina**; frond narrow, tapering, once or twice pinnated; pinnæ flexuous. (TAB. C.)

LX. GELIDIUM.

191. **corneum**; distichous; branches linear, narrowed at each end, pinnate or bi-tri-pinnate; pinnules opposite or alternate, patent, obtuse. (TAB. LIII.)
192. **cartilagineum**; several times pinnated; pinnæ and pinnulæ erecto-patent, with rounded axils, linear, obtuse. (TAB. CCCXXXVII.)

LXI. GIGARTINA.

193. **pistillata**; frond compressed, stipitate, flabellately branched; branches repeatedly forked, with rounded axils, naked or pinnated with short, horizontal ramuli; tubercles solitary or in pairs, on the ramuli. (TAB. CCXXXII.)
194. **acicularis**; cylindrical, irregularly branched, between pinnated and dichotomous; branches divaricating; ramuli few, recurved, subulate; tubercles scattered on the branches. (TAB. CIV.)
195. **Teedii**; frond flaccid, flattish, linear, acuminate, repeatedly pinnate; pinnæ horizontal, set with horizontal, spine-like ramuli. (TAB. CCLXVI.)
196. **mamillosa**; frond fan-shaped, dichotomous, plane, channelled; segments wedge-shaped; tubercles roundish or ovate, pedicellate, scattered over the disc of the frond. (TAB. CXCIX.)

LXII. CHONDRUS.

197. **crispus**; frond stipitate, thickish, cartilaginous; the segments wedge-shaped, variable in breadth; apices emarginate; axils obtuse; sori elliptical or oblong, scattered. (TAB. LXIII.)
198. **Norvegicus**; frond linear, dichotomous, flat, dull red; axils patent; apices rounded; favellidia minute, imbedded in the substance; nemathecia scattered over both surfaces. (TAB. CLXXXVII.)

LXIII. PHYLLOPHORA.

199. **rubens**; stipe short, expanding into the cuneate base of a narrow, obscurely midribbed, rigid, blood-red frond, which is repeatedly proliferous; tubercles scattered over the surface, wrinkled. (TAB. CXXXI.)
200. **membranifolia**; stem filiform, elongated, branched; branches expanding into broadly wedge-shaped, or fan-shaped, dichotomous dull purple laminæ; tubercles on short stalks, rising from the stem or the laminæ. (TAB. CLXIII.)

201. **Brodiaei**; stem filiform, branched; the branches terminating in forked, membranous leaflets, proliferous at the extremity; tubercles sessile on the tips of the segments. (TAB. XX.)
202. **palmettoides**; root a wide-spread disc; stem filiform, expanding into an oblong or cuneate, simple or once-forked, rose-coloured frond; sorus solitary, transverse, elliptical, immersed below the apex of the frond. (TAB. CCCX.)

LXIV. PEYSSONELIA.

203. **Dubyi**; frond membranaceous, orbicular or lobed, attached by the whole of its under surface. (TAB. LXXI.)

LXV. GYMNOGONGRUS.

204. **Griffithsiae**; dichotomous, fastigate; warts surrounding the stem. (TAB. CVIII.)
205. **plicatus**; horny, dark purple, entangled, wiry, irregularly branched; branches of various lengths, forked, with very wide axils; warts oblong, irregular, scattered. (TAB. CCLXXXVIII.)

LXVI. POLYIDES.

206. **rotundus**. (TAB. XCV.)

LXVII. FURCELLARIA.

207. **fastigiata**. (TAB. XCIV. and CCCLVII. A.)

LXVIII. DUMONTIA.

208. **filiformis**; frond undivided, attenuated to each extremity, pinnated with long, simple, tapering branches. (TAB. LIX. and CCCLVII. B.)

LXIX. HALYMENIA.

209. **ligulata**; frond compressed or flat, irregularly dichotomous or palmate; the segments attenuated. (TAB. CXII.)

LXX. GINANNIA.

210. **furcellata**; cylindrical, tender, uniformly dichotomous; apices obtuse. (TAB. LXIX.)

LXXI. KALLYMENIA.

211. **reniformis**; stipe short, terete, suddenly expanding into a roundish or irregularly cleft, blood-red frond. (TAB. XIII.)
212. **Dubyi**; stem compressed, gradually expanding into an obovate or cuneated, dull red lamina. (TAB. CXXIII.)

LXXII. IRIDÆA.

213. **edulis**; frond obovate. (TAB. XCVII.)

LXXIII. CATENELLA.

214. **Opuntia**; root creeping; stems vaguely branched; internodes lanceolate or elliptical, four times as long as broad. (TAB. LXXXVIII.)

LXXIV. CRUORIA.

215. **pellita**. (TAB. CXVII.)

LXXV. NACCARIA.

216. **Wiggii**; frond filiform; branches alternate, repeatedly divided, attenuate; ramuli spindle-shaped, quadrifarious. (TAB. XXXVIII.)

LXXVI. GLOIOSIPHONIA.

217. **capillaris**. (TAB. LVII.)

LXXVII. NEMALEON.

218. **multifidum**; frond dichotomous, slightly branched, dull purplish-red; the axils rounded. (TAB. XXXVI.)
219. **purpureum**; stem undivided, attenuate at the base and apex; branches lateral, scattered, tapering, naked or having a second series of similar branchlets. (TAB. CLXI.)

LXXVIII. DUDRESNAIA.

220. **coccinea**; rosy red, irregularly much branched; branches moniliform, attenuated upwards, decompound. (TAB. CCXLIV.)
221. **divaricata**; pale red, excessively branched; branches horizontal, once or twice pinnated; ramuli divaricating. (TAB. CX.)

LXXIX. CROUANIA.

222. **attenuata**. (TAB. CVI.)

Order 13. CERAMIACEÆ.

LXXX. PTILOTA.

223. **plumosa**; cartilaginous, decompound; secondary branches bi-tri-pinnate; pinnae and pinnulae opposite, the latter subulate, inarticulate, but traversed by a jointed midrib; favellae involucrate, pedicellate. (TAB. LXXX.)
224. **sericea**; flaccid; the pinnulae articulate, formed of a single row of cells. (TAB. CXCI.)

LXXXI. MICROCLADIA.

225. **glandulosa**. (TAB. XXIX.)

LXXXII. CERAMIUM.

* *Smooth; frond uniformly coloured throughout.*

226. **rubrum**; robust, gradually attenuated, irregularly dichotomous with lateral, forked or multifid ramuli; apices hooked inwards; articulations unarmed, coloured; tetraspores whorled, immersed; favellae involucrate, on the lateral branchlets. (TAB. CLXXXI.)
227. **botryocarpum**; filaments crooked at the base, robust, attenuated, irregularly dichotomous, with crowded, lateral, mostly simple ramuli; apices straight; articulations coated with cells, unarmed; dissepiments constricted; tetraspores whorled, immersed; favellae terminating the lateral branchlets, involucrate. (TAB. CCXV.)

(The so-called "*favellae*" of the text (under Pl. CCXV.) are diseased *tetraspores*.)

* * *Smooth; nodes coloured, internodes colourless.*

228. **decurrens**; robust, attenuated, dichotomous, with lateral dichotomous

branchlets; apices hooked inwards; internodes partially clothed with coloured cells, which extend from the nodes, but leave a colourless band in the centre of each internode. (TAB. CCLXXVI.)

229. **Deslongchampsii**; subsetaceous, attenuated, irregularly dichotomous, with or without lateral ramuli; apices straight, spreading; internodes colourless, the lower thrice as long as broad, upper very short; dissepiments purple, scarcely swollen; tetraspores whorled. (TAB. CCXIX.)
230. **diaphanum**; filaments setaceous, attenuated upwards, irregularly dichotomous, with short, lateral, dichotomous ramuli; internodes colourless, the lower long; nodes swollen, coloured; tetraspores whorled in the nodes; favellæ subterminal, involucre. (TAB. CXCIII.)
231. **gracillimum**; excessively slender, very flaccid, dichotomous, with minute, flabelliform, dichotomous, lateral ramuli; internodes colourless, long; nodes opaque, purple; favellæ on the lateral ramuli, with a spreading involucre. (TAB. CCVI.)
232. **strictum**; capillary, dichotomous, all the divisions straight and erect, with narrow, acute axils; apices slightly incurved; internodes colourless; nodes (smooth or hairy) opaque, purple; favellæ near the ends of the branches, involucre; spores erumpent, whorled. (TAB. CCCXXXIV.)
233. **nodosum**; capillary, rigid, dichotomous, fastigate; axils very patent; articulations pellucid, 4-6 times as long as broad; dissepiments swollen; tetraspores erumpent, on the outer edge of short ramuli; favellæ near the tips of short ramuli. (TAB. XC.)
234. **fastigiatum**; capillary, flaccid, dichotomous, level-topped, rosy; axils acute; internodes pellucid, 4-6 times longer than broad, the upper short and coloured; nodes coated with cells, not swollen; favellæ subterminal, involucre. (TAB. CCLV.)

* * * *Nodes armed with spines or prickles.*

235. **flabelligerum**; setaceous, attenuated upwards, flabellately branched, irregularly dichotomous, with lateral, forked ramuli; the internodes clothed with coloured cellules; apices nearly straight; nodes contracted, each armed on the outer edge with a single, minute, subulate, coloured, 3-jointed prickles; tetraspores erumpent, whorled round the joint. (TAB. CXLIV.)
236. **echionotum**; dichotomous, fastigate, with pellucid internodes; apices involute; nodes armed with numerous, slender, scattered, subulate, colourless, 1-jointed prickles; tetraspores solitary, erumpent, on the outer edge of the node; favellæ subtended by several, strongly incurved ramuli. (TAB. CXLI.)
237. **acanthonotum**; dichotomous, fastigate, with pellucid internodes; apices strongly involute; nodes armed on the outer edge with a single, robust, broadly subulate, coloured, three-jointed prickles; tetraspores erumpent, whorled round the node; favellæ subtended by a short ramulus. (TAB. CXL.)
238. **ciliatum**; dichotomous, fastigate, with pellucid internodes; apices strongly involute; nodes whorled with several robust, subulate, 3-jointed prickles; tetraspores alternating with the prickles; favellæ subtended by two or three ramuli. (TAB. CXXXIX.)

LXXXIII. SPYRIDIA.

239. **filamentosa**; irregularly branched, subopaque; branches set with setaceous ramuli. (TAB. XLVI.)

LXXXIV. GRIFFITHSIA.

* *Branches set with short ramelli.*

240. **equisetifolia**; stems robust; branches whorled throughout with closely imbricated, incurved, many times forked ramelli. (TAB. LXVII.)
241. **simplicifilum**; stems slender, irregularly branched, whorled with imbricated, straight, once-forked ramelli. (TAB. CCLXXXVII.)
242. **barbata**; dichotomous, slender; upper articulations emitting opposite or whorled, byssoid, dichotomous, short ramelli, to which the tetraspores are attached; favellæ stalked. (TAB. CCLXXXI.)

* * *Stems dichotomous, naked.*

243. **Devoniensis**; very slender, flaccid, dichotomous, the lower axils wide, the upper very acute; articulations cylindrical, 7-8 times as long as broad; involucre of tetraspores whorled round the dissepiments of the branches. (TAB. XVI.)
244. **corallina**; dichotomous, gelatinous; articulations pear-shaped, the ultimate ellipsoid; involucre sessile, those with tetraspores whorled round the branch, with favellæ lateral. (TAB. CCXIV.)
245. **secundiflora**; filaments ultra-setaceous, irregularly dichotomous; axils acute; branches fastigate, obtuse, not tapering; articulations cylindrical, 2-4 times as long as broad, with a very wide border. (TAB. CLXXXV.)
246. **setacea**; filaments setaceous, straight, rigid, di-trichotomous; axils very acute; branches gradually attenuated to a point; articulations cylindrical, 5-6 times as long as broad; involucre, of both kinds, pedunculate, lateral. (TAB. CLXXXIV.)

LXXXV. WRANGELIA.

247. **multifida**; stems setaceous, jointed, pinnate or bipinnate; ramuli opposite or whorled, pinnato-multifid. (TAB. XXVII.)

LXXXVI. SEIROSPORA.

248. **Griffithsiana**. (TAB. XXI.)

LXXXVII. CALLITHAMNION.

* *Ramuli opposite.*

249. **Plumula**; stems dichotomous, articulated; each articulation bearing a pair of short, recurved plumules, pectinated on their upper margin. (TAB. CCXLII.)
250. **cruciatum**; densely tufted, subdichotomous, articulate; branches furnished at each joint with two or four, opposite or quaternate, short, pinnated ramuli; tetraspores elliptical, at the base of the ramuli. (TAB. CLXIV.)
251. **floccosum**; capillary, very flaccid, remotely branched; branches alternate, articulated, every joint bearing a pair of minute, opposite, spine-like ramuli; tetraspores elliptical, pedicellate. (TAB. LXXXI.)
252. **Turneri**; filaments rising from creeping fibres, simple or compound, once or twice pinnated with opposite, spreading ramuli; articulations of the main filaments 5-10 times as long as broad; tetraspores clustered, racemose or corymbose; favellæ involucred, stalked. (TAB. CLXXIX.)
253. **barbatum**; irregularly branched; branches alternate, subsimple, naked, or pinnulated with minute, opposite, spine-like ramuli; articulations twice as long as broad. (TAB. CLXV.)

254. **Pluma**; minute, rising from creeping filaments; stems erect, simple or branching; branches naked below, pinnated above; pinnæ erect, opposite, close; tetraspores globose, on short processes of the pinnules. (TAB. CCXCVI.)

* * *Stems shrubby, robust, more or less opaque. Ramuli alternate.*

255. **arbuscula**; stems shrubby, opaque, naked below, robust, much branched; branches densely set on all sides with minute imbricated plumules; ultimate pinnules simple or forked, recurved, their articulations twice as long as broad; tetraspores globose, lining the inner face of the pinnules. (TAB. CCLXXIV.)

256. **Brodiaei**; stem subopaque, veiny, obscurely jointed, slender; branches lateral, patent, closely set with quadrifarious secondary branches; plumules simply pinnate, the pinnæ sometimes ramulose at the tip; tetraspores oval, sessile near the tips of the pinnules; favellæ bilobed, on the secondary branches. (TAB. CXXIX.)

257. **tetragonum**; outline of the frond ovate; stem thick, setaceous, opaque, veiny, set with quadrifarious, lateral branches; penultimate branches articulate, set with short, alternate, level-topped plumules; pinnules incurved, constricted at the base, suddenly acuminate, their articulations once and half as long as broad; tetraspores very minute, oval, subterminal. (TAB. CXXXVI.)

258. **brachiatum**; character of *C. tetragonum*, except that the lowermost plumules are reduced to subulate ramuli; and the pinnules are not constricted at base, and taper *gradually* (not suddenly) at the apex. (TAB. CXXXVII.)

259. **tetricum**; rigid, shrubby; stem and branches robust, shaggy below, plumulate above; plumules crowded, simply pinnate; pinnæ acute, tapering at the base, erecto-patent; articulations twice or thrice as long as broad; tetraspores elliptical, minute, sessile on short lateral processes of the pinnæ. (TAB. CLXXXVIII.)

260. **Hookeri**; stem setaceous, nearly opaque, pinnatedly much branched; branches decomposed, spreading, flexuous, densely plumulate; plumules naked below, pinnate or sub-bipinnate above, the pinnæ horizontal or divaricating, ramulose at the tips; articulations 2-3 times as long as broad; tetraspores numerous, sessile on the pinnules. (TAB. CCLXXIX.)

* * * *Main stems slender, evidently jointed; branches decomposed-pinnate. Ramuli alternate.*

261. **roseum**; much and loosely branched; secondary branches long, flexuous, distichously plumulate; plumules lax, simply pinnate; pinnæ long, spreading, curved; articulations 4-5 times as long as broad; tetraspores elliptical, secund, four or five on each pinna. (TAB. CCXXX.)

262. **byssoideum**; exceedingly slender, and flaccid, decomposed; plumules long, flexuous, pinnate or sub-bipinnate; articulations of the branches eight, of the ramuli four times as long as broad; tetraspores one or two, sessile near the base of the pinnules. (TAB. CCLXII.)

263. **polyspermum**; tufts globose; filaments slender, much branched, secondary branches distichously plumulate; plumules long and narrow, simply pinnate; pinnæ short, simple, spine-like, patent; articulations 4-5 times as long as broad; tetraspores globose, lining the inner face of the pinnæ. (TAB. CCXXXI.)

264. **purpurascens**, Sm. E. Bot. t. 2465. (*Unknown to me.*)

265. **fasciculatum**; plumules long, erect, linear-obovate, truncate; pinnæ flexuous, the lower simple, appressed, the upper erecto-patent, ramulose near the tip; articulations of the branches veiny, thrice, of the ramuli once or twice as long as broad, with contracted dissepiments. (TAB. CCCVIII.)
266. **Borreri**; much branched, subdistichous, slender; branches set with plumules which are bare of ramuli in their lower half, and simply pinnate in their upper; pinnæ patent; articulations of the branches 2-5 times, of the pinnæ twice, as long as broad; tetraspores roundish, sessile on the inner face of the pinnules. (TAB. CLIX.)
267. **affine**; much branched and bushy; stem veiny; secondary branches long, densely plumulate; plumules very narrow, simply pinnate; pinnæ short, erect, the upper longest, crowded at the tips; articulations of the branches 3-4, of the pinnæ once and half as long as broad; tetraspores solitary, super-axillary. (TAB. CCCXXXI.)
268. **tripinnatum**; distichous, capillary, decompound-pinnate; plumules obovate, tripinnate above; the lower pinnæ short and abortive; each pinna having at its axil a minute pinnule; tetraspores oval, lateral on the axillary pinnules. (TAB. LXXVII.)
269. **gracillimum**; distichously branched, fan-shaped; stems capillary, decompound-pinnate; plumules bi-tri-pinnate; articulations of the stem 3-4, of the pinnæ 2-3 times as long as broad; tetraspores terminating the ultimate pinnules. (TAB. V.)
270. **thuyoideum**; capillary, distichously decompound, and repeatedly pinnate; plumules bi-tri-pinnate, lanceolate; articulations variable; tetraspores on the tips of the ultimate pinnules. (TAB. CCLXIX.)

* * * * * *Stems articulate; branches and ramuli dichotomous.*

271. **corymbosum**; setaceous below, byssoid above, excessively branched; lesser branches repeatedly dichotomous, level-topped; ramuli many times forked; articulations of the branches 8-10 times as long as broad; tetraspores solitary and axillary, sessile. (TAB. CCLXXII.)
272. **spongiosum**; stems robust, opaque and veiny; branches quadrifarious, thickly clothed with dichotomous ramuli; axils patent; apices bifid; articulations of the branches swollen at the joints, twice or thrice as long as broad. (TAB. CXXV.)
273. **pedicellatum**; setaceous, pellucid, jointed throughout, irregularly divided; lesser branches dichotomous; apices very obtuse; articulations several times as long as broad; tetraspores stalked, pear-shaped, axillary. (TAB. CCXII.)

* * * * * *Of small size and densely tufted, or minute parasites.*

274. **Rothii**; widely spreading, densely tufted; filaments very short, subdichotomous; branches very erect, straight, simple; articulations twice as long as broad; tetraspores oval, clustered, on short subterminal, corymbose ramuli. (TAB. CXX. B.)
275. **floridulum**; tufts very dense, globose, fastigate; filaments slender, dichotomous; branches very erect, straight, simple; articulations thrice as long as broad; tetraspores oval, on short secund pedicels, along the branches. (TAB. CXX. A.)
276. **mesocarpum**; rising from creeping filaments; stems erect, subsimple; branches alternate, very erect, naked or nearly so; articulations 4-5 times as long as broad; tetraspores elliptical, on long, simple or forked, lateral pedicels. (TAB. CCCXXV.)

277. **sparsum**; parasitical, minute, scattered; filaments tufted, sparingly branched; branches simple, spreading, unequal; articulations 2-3 times as long as broad. (TAB. CCXCVII.)
278. **Daviesii**; rose-red, minute, tufted, much branched; branches curved; ramuli longish, crowded toward the axils of the secondary branches; tetraspores on the axillary ramuli, stalked. (TAB. CCCXIV.)
279. **virgatulum**; rose-red, minute, tufted, much branched; branches long and straight, alternate or secund; ramuli from every joint, short, obtuse, mostly secund; articulations thrice as long as broad; tetraspores scattered. (TAB. CCCXIII.)

III. CHLOROSPERMEÆ.

Order 14. SIPHONACEÆ.

LXXXVIII. CODIUM.

280. **Bursa**; frond spherical, hollow. (TAB. CCXC.)
281. **adhærens**; frond forming a velvety crust on the surface to which it adheres. (TAB. XXXV. A.)
282. **amphibium**; fronds minute, erect, cylindrical, simple or nearly so, obtuse, aggregated in widely spreading strata. (TAB. XXXV. B.)
283. **tomentosum**; frond dichotomous. (TAB. XCIII.)

LXXXIX. BRYOPSIS.

284. **plumosa**; branches naked below, closely pinnated above the middle; pinnæ subdistichous. (TAB. III.)
285. **hypnoides**; slender, very much branched; ramuli capillary, ramellose towards the tips, irregularly inserted. (TAB. CXIX.)

XC. VAUCHERIA.

286. **submarina**; tufted, dichotomous, fastigate; sporangia numerous, lateral, sessile, ovate or lanceolate. (TAB. CCCL. B.)
287. **marina**; tufted; branches few, long, obtuse; sporangia solitary, obovate, pedicellate, lateral. (TAB. CCCL. A.)
288. **velutina**; filaments creeping; branches short, erect, fastigate, woven into a velvety stratum; sporangia globose, solitary, lateral, on short stalks. (TAB. CCCXXI.)

Order 15. CONFERVACEÆ.

XCI. CLADOPHORA.

289. **Brownii**; tufts cushion-like, dense, fastigate; filaments interwoven, flexuous, slightly branched; branches subsimple; articulations thickened upwards, 4-5 times as long as broad. (TAB. XXX.)
290. **repens**; tufts dense, globular; filaments rooting below, slightly branched; branches erect, sub-simple; ramuli few; articulations cylindrical, 10-20 times as long as broad. (TAB. CCXXXVI.)
291. **pellucida**; rigid, erect, setaceous, dark green, di-trichotomous; axils of

- the branches very acute; dissepiments only at the forking of the branches and ramuli; articulations very long. (TAB. CLXXIV.)
292. **rectangularis**; filaments loosely tufted, setaceous, rigid; branches opposite, horizontal, distant, set with short, opposite, very patent ramuli; articulations 2-3 times as long as broad. (TAB. XII.)
293. **Macallana**; filaments setaceous, rigid, flexuous, loosely bundled, much branched; branches alternate, very patent; ramuli short, recurved, simple, obtuse; articulations twice or thrice as long as broad. (TAB. LXXXIV.)
294. **Hutchinsiae**; filaments setaceous, rigid, crisp, glaucous-green, flexuous, loosely tufted; ramuli erecto-patent, simple or pectinulate on the inner face; apices very obtuse; articulations 2-3 times as long as broad. (TAB. CXXIV.)
295. **diffusa**; filaments subsetaceous, loosely tufted, rigid, full green, flexuous, much branched; branches distant, irregularly subdivided, or subdichotomous, ramulose above; ramuli simple, secund; articulations 3-4 times as long as broad. (TAB. CXXX.)
296. **nuda**; rigid, slender, straight, dull green, sparingly dichotomous; branches few, scattered, appressed; articulations many times longer than broad. (TAB. CCCLL.)
297. **rupestris**; capillary, rigid, dark green, straight, bushy; branches erect, crowded, densely clothed with appressed, opposite or alternate ramuli; articulations 3-4 times as long as broad. (TAB. CLXXX.)
298. **laetevirens**; much branched, bushy, yellow-green; branches crowded, repeatedly divided, flexuous; ramuli secund, blunt, of few articulations; articulations of the branches six times, of the ramuli thrice, as long as broad. (TAB. CXC.)
299. **flexuosa**; capillary, tufted, flexuous, pale green, much branched; branches set with curved secondary or tertiary branches, which are pectinated with short, simple, secund, curved ramuli; articulations 3-4 times as long as broad. (TAB. CCCLIII.)
300. **gracilis**; filaments very long, capillary, flexuous, silky, much branched, yellow-green; main branches angularly bent; ramuli pectinate, secund, much attenuated, elongate; articulations 3-5 times longer than broad. (TAB. XVIII.)
301. **Balliana**; filaments very long, extremely slender and soft, grass-green, excessively branched; penultimate branches virgate and set with slender, secund, short ramuli; articulations of the branches eight to ten times, of the ramuli six to eight times, as long as broad. (TAB. CCCLVI.)
302. **Rudolphiana**; filaments very long and slender, flexuous, soft, much branched, yellow-green; branches irregular; ultimate ramuli very long, pectinate, patent; articulations many times longer than broad. (TAB. LXXXVI.)
303. **refracta**; filaments capillary, bright green, very much branched; secondary branches quadrifarious, repeatedly divided; branchlets closely set and widely spreading; ramuli pectinated; articulations twice or thrice as long as broad. (TAB. XXIV.)
304. **albida**; tufts dense, elongate, silky or spongy, soft; filaments exceedingly slender, decompound; branches patent, the upper ones frequently opposite; ramuli opposite or secund; articulations 4-5 times as long as broad. (TAB. CCLXXV.)
305. **lanosa**; filaments slender, short, yellow-green, forming dense, globular

- tufts; branches virgate, erect, subdistant, straight, alternate; ramuli few, scattered; axils very acute; lower articulations twice, upper six times as long as broad. (TAB. VI.)
306. **uncialis**; tufts short, spongy, divided; filaments flexuous, sparingly branched, interwoven and rooting; ramuli secund, distant; articulations twice as long as broad. (TAB. CCVII.)
307. **arcta**; tufts very dense, starry, bright green; filaments matted at the base, much branched; branches straight, crowded, very erect; ramuli appressed; articulations in the older parts once or twice as long as broad, in the younger many times longer. (TAB. CXXXV.)
308. **glaucescens**; tufts dense, glaucous green; filaments very slender, zigzag, much branched; branches erect, lesser ones pectinate, with very erect, close-set, straight, elongated ramuli; articulations thrice as long as broad. (TAB. CXCVI.)
309. **falcata**; densely tufted, dark green; filaments rigid, curved, irregularly divided; branches zigzag, decompound, the lesser branches arched, or incurved and falcate, ramulose on their inner faces; ramuli blunt; articulations 3-4 times as long as broad, with a dense endochrome and pellucid dissepi-ments. (TAB. CCXVI.)
310. **Magdalenæ**; filaments capillary, blackish-green, short, decumbent, matted together, slightly branched, angularly bent; branches divaricate, dichotomous; ramuli few, falcate; articulations three to four times as long as broad. (TAB. CCCLV. A.)
311. **Gattyæ**; filaments short, dingy green, capillary, matted together, densely tufted, dichotomous, flexuous, with few ramuli; articulations once and half as long as broad. (TAB. CCCLV. B.)
312. **flavescens**; forming pale yellowish strata; filaments slender, sparingly divided, subdichotomous, flexuous; ramuli long, alternate or secund; articulations 8-9 times as long as broad. (TAB. CCXCVIII.)
313. **fracta**; tufts entangled, often floating, dull green; filaments rigid, distantly branched, subdichotomous, with wide axils; ramuli few, alternate or secund; articulations 3-6 times as long as broad, at length elliptical. (TAB. CCXCIV.)

XCII. RHIZOCLONIUM.

314. **riparium**; slender, pale green, flaccid, angularly bent; articulations about twice as long as broad. (TAB. CCXXXVIII.)
315. **Casparyi**; filaments extremely slender, pale, interwoven, curved and bent; angles emitting root-like branches; articulations 2-6 times longer than broad; endochrome granular. (TAB. CCCLIV. B.)

XCIII. CONFERVA.

* *Decumbent, stratified.*

316. **arenicola**; threads soft, extremely fine, matted, very pale green; articulations once and half as long as broad. (TAB. CCCLIV. A.)
317. **arenosa**; filaments slender, straightish, rigid, forming wide strata; joints 3-5 times as long as broad. (TAB. LIV. C.)
318. **litorea**; filaments thick, rigid, crisped, loosely bundled, dull green; articulations once and half as long as broad, here and there swollen in pairs and discoloured. (TAB. CCCXXXIII.)

319. **Linum**; filaments very thick, of great length, curled, rigid, loosely bundled; articulations as long as broad. (TAB. CL. A.)
320. **sutoria**; filaments setaceous, long, flexuous, dark green; articulations once and half as long as broad. (TAB. CL. B.)
321. **tortuosa**; filaments rigid, slender, curled, interwoven in spreading strata; joints twice or thrice as long as broad. (TAB. LIV. A.)
322. **implexa**; filaments very slender, rather flaccid, forming entangled, bright-green strata; joints as long as, or longer than broad. (TAB. LIV. B.)

* * *Fixed by the base, tufted.*

323. **Melagonium**; filaments erect, straight, robust, slightly tufted, stiff and wiry, dark green; joints twice as long as broad. (TAB. XCIX. A.)
324. **aerea**; filaments fixed, long, setaceous, tufted, straight, harsh, brittle, yellow-green; joints as long as broad. (TAB. XCIX. B.)
325. **collabens**; filaments long, straight, tufted, variable in diameter, gelatinous and flaccid, æruginous green; articulations as long as broad, with dense, granular endochrome. (TAB. CCCXXVII.)
326. **bangioides**; filaments long, slender, soft, lubricous, wavy; articulations twice as long as broad, containing at maturity a dense green mass; dissepiments broad and pellucid. (TAB. CCLXVIII.)
327. **Youngana**; filaments short, tufted, nearly straight; articulations once or twice as long as broad; dissepiments contracted. (TAB. CCCXXVIII.)
328. **clandestina**, Berk. Gl. Br. Alg. t. 13. f. 1. (*Unknown to me.*)

XCIV. OCHLOCHÆTE.

329. **Hystrix**. (TAB. CCXXVI.)

Order 16. ULVACEÆ.

XCV. ENTEROMORPHA.

330. **cornucopiæ**; gregarious, small; fronds stipitate, suddenly dilated, at length torn, plaited at the margin. (TAB. CCCIV.)
331. **intestinalis**; simple, clavate, at length inflated, tapering much to the base. (TAB. CLIV.)
332. **compressa**; branching, compressed, more or less compounded; branches subsimple, obtuse, much attenuated at the base. (TAB. CCCXXXV.)
333. **Linkiana**; cylindrical, reticulated, very pale, membranaceous (rigid when dry), much branched; branches alternate, spreading. (TAB. CCCXLIV.)
334. **erecta**; frond cylindrical, filiform, slender; branches erect, opposite or alternate, all attenuated to a point; ramuli capillary, erecto-patent; cells rectangular, filled with endochrome. (TAB. XLIII.)
335. **clathrata**; cylindrical, filiform, slender, reticulated, much branched; branches decompound, spreading, set with divaricated, spine-like ramuli. (TAB. CCCXL.)
336. **ramulosa**; frond subcompressed, irregularly branched; main divisions long and subsimple; lateral branches curved and twisted, everywhere clothed with short, divaricated, spine-like ramuli. (TAB. CCXLV.)
337. **Hopkirkii**; frond byssoid, excessively branched; branches erect, attenuate, bearing scattered, subulate ramuli; reticulations very large, each areole containing one or two minute grains. (TAB. CCLXIII.)

338. **percursa**; capillary, entangled, simple, compressed, subsolid, reticulated; cells quadrate, two or more in the breadth of the frond; endochrome filling the cell. (TAB. CCCLII.)
339. **Ralfsii**; capillary, simple or nearly so, subsolid, largely reticulated; areoles large, hyaline, 2-4 in the breadth of the frond, each containing a bright-green grain of endochrome. (TAB. CCLXXXII.)

XCVI. ULVA.

340. **latissima**; frond broadly ovate or oblong, membranous, full-green. (TAB. CLXXI.)
341. **Lactuca**; frond very delicate, at first saccate; then cleft to the base into numerous laciniated flat segments. (TAB. CCXLIII.)
342. **Linza**; frond linear-lanceolate, undulate. (TAB. XXXIX.)

XCVII. PORPHYRA.

343. **laciniata**; frond deeply and irregularly cleft. (TAB. XCII.)
344. **vulgaris**; frond simple, lanceolate, wavy. (TAB. CCXI.)
- 344.* *P. miniata*, Ag.—Carm. Hook. Br. Fl. v. ii. p. 310. (*Unknown to me.*)

XCVIII. BANGIA.

345. **fuscopurpurea**; stratum brownish-purple; filaments long, simple, decumbent, here and there constricted; granules several in each transverse band. (TAB. XCVI.)
346. **ciliaris**; filaments very minute, erect, simple, straight, compressed, purple; grains two or three in each transverse band, globose, sometimes solitary. (TAB. CCCXXII.)
347. **ceramicola**; filaments parasitical, very slender, elongate, rosy; articulations once or twice as long as broad, longitudinally striate; the endochrome at length globular. (TAB. CCCXVII.)
348. **carnea**, Dillw. t. 84. (*Unknown to me.*)
349. (?) **elegans**; filaments minute, dichotomous, with wide axils; granules binate, in a single row. (TAB. CCXLVI.)

Order 17. OSCILLATORIACEÆ.

XCIX. RIVULARIA.

350. **plicata**; fronds gregarious, gelatinous, plaited, often hollow and at length ruptured, dull dark green; filaments wavy, associated in dichotomous series. (TAB. CCCXV.)
351. **atra**; globose, minute, very firm and smooth, glossy, black-green; filaments densely packed. (TAB. CCXXXIX.)
352. **applanata**, Carm. in Hook. Br. Fl. vol. ii. p. 392. (*Unknown to me.*)
353. **nitida**; frond subgelatinous, lobed and plaited, hollow, lubricous, dark shining green. (TAB. LXVIII.)

C. SCHIZOSIPHON.

354. **Warreniæ**. (TAB. CCCXVI.)

CI. SCHIZOTHRIX.

355. **Cresswellii**; tufts pulvinate; filaments very slender, fastigate, collected into branching bundles. (TAB. CLX.)

CII. CALOTHRIX.

356. **confervicola**; filaments short, tufted, glaucous green, opaque, blunt, rigid, nearly straight. (TAB. CCLIV.)
357. **mucor**, Ag.—Br. Fl. vol. ii. p. 367. (*Unknown to me.*)
358. **luteola**; filaments exceedingly minute, slender, scattered, filiform, obtuse, hyaline or containing light green endochrome. (TAB. CCCXLII.)
359. **scopulorum**; stratum velvety, dirty green; filaments flexuous, subulate, subattenuate, simple. (TAB. LVIII. B.)
360. **fasciculata**; stratum widely spreading, velvety, dark green; filaments straight, subulate, attenuated, fasciculately pseudo-branched. (TAB. LVIII. A.)
361. **pannosa**; filaments long, much curled, and densely interwoven into lamellated tufts or honey-combed strata; endochrome filling the tube, dark green, densely annulated. (TAB. LXXVI.)
362. **sempilena**; filaments long, slender, tough, flexuous, densely interwoven in lamellated tufts; endochrome glaucous, frequently interrupted, leaving parts of the tube empty. (TAB. CCCIX.)
363. **hydnoides**; patches widely spreading, dark green; filaments flexuous, decumbent, their tips cohering in rigid, erect, tooth-like fascicles; border rather wide. (TAB. CCCVI.)
364. **cæspitula**; tufts convex, soft, cushioned, blackish-green; filaments densely packed, flexuous, obtuse, not attenuated; border narrow. (TAB. CCCV.)

CIII. LYNGBYA.

* *Tube continuous; endochrome cylindrical, imperfectly annulated.*

365. **majuscula**; strata of large dimensions, blackish-green; filaments thick, bundled, twisted, obtuse; endochrome densely annulated. (TAB. LXII.)
366. **ferruginea**; filaments slender, flaccid, forming a stratum of a verdigris-green colour, which at length changes to pale chestnut. (TAB. CCCXI.)

* * *Tube imperfectly articulated; endochrome distinctly annulated, with pellucid interspaces.*

367. **Carmichaelii**; filaments very long, thickish, curled, grass-green; tube imperfectly jointed. (TAB. CLXXXVI. A.)
368. **speciosa**; filaments very long, thick, flaccid, straight, at length curled, the margin slightly crenate, yellow-green, glossy when dry; tube imperfectly jointed. (TAB. CLXXXVI. B.)
369. **flacca**; filaments short, tufted, nearly straight, occasionally proliferous, articulated; articulations shorter than their breadth; endochrome at length much contracted. (TAB. CCC.)
370. **Cutleriae**; exceedingly slender, soft, articulated; articulations as long as broad, the endochrome at length spherical. (TAB. CCCXXXVI.)

CIV. MICROCOLEUS.

371. **anguiformis**; sheaths snake-like, simple, decumbent, tapering to one extremity; striæ distant. (TAB. CCXLIX.)

CV. OSCILLATORIA.

372. **littoralis**; stratum vivid green; filaments thick, dark green, curved; striæ conspicuous, closely set. (TAB. CV. A.)
373. **subsalsa**, Ag.—Br. Fl. vol. ii. p. 376. (*Unknown to me.*)

374. **spiralis**; stratum membranaceous, dark green, not very lubricous; filaments slender, spirally twisted, densely interwoven. (TAB. CV. B.)
375. **nigroviridis**; stratum very dark; filaments pale green, with obtuse, curved apices; striæ distant, half the diameter of the filament. (TAB. CCLI. A.)
376. **subuliformis**; stratum æruginous-green; filaments bright green, subuliform; striæ distant $\frac{1}{2}$ — $\frac{3}{4}$ the diameter of the filament. (TAB. CCLI. B.)
377. **insignis**; stratum blackish-brown; filaments brown, very thick, their apices obtuse, slightly oblique and ciliated; striæ very close. (TAB. CCLI. C.)

CVI. SPIRULINA.

378. **tenuissima**; stratum very lubricous, æruginous; filaments densely spiral, very slender, flexuous. (TAB. CV. C.)
379. **Hutchinsiae**, Kütz. (*Unknown to me.*)

Order 18. NOSTOCHACEÆ.

CVII. MONORMIA.

380. **intricata**. (TAB. CCLVI.)

CVIII. SPHÆROZYGA.

381. **Carmichaelii**; spores oblong, twice or thrice as long as broad, next the connecting cell. (TAB. CXIII. A.)
382. **Thwaitesii**; spores elliptical, once and a half as long as broad, distant from the ciliated connecting cell. (TAB. CXIII. B.)
383. **Broomei**; spores numerous, elliptical, twice as long as wide, commencing nearest the connecting cells, which are smooth and subquadrate. (TAB. CLXXIII. A.)
384. **Berkeleyana**; spores large, twice the width of ordinary cells, oblong, half as long again as wide, brown when mature, two on each side the connecting cell, which is spheroidal. (TAB. CLXXIII. B.)
385. **Ralfsii**, Thw.—Harv. Man. ed. 2. p. 233. (*Not figured.*)

CIX. SPERMOSIRA.

386. **litorea**; filaments nearly straight; cells very short, compressed, closely packed; spores elliptical, not wider than the cells. (TAB. CXIII. C.)
387. **Harveyana**; filaments much curved, composed of cells nearly as long as broad; spores exactly spherical, almost twice the diameter of the cells; connecting cells subquadrate, rather longer than wide, and of the same width as the ordinary cells. (TAB. CLXXIII. C.)

Order 19. PALMELLACEÆ.

CX. HORMOSPORA.

388. **ramosa**; branched; endochrome radiated. (TAB. CCXIII.)

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TO THE

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Daviesii . . .	278	314	scopulorum	359	58
fasciculatum	265	308	semiplena	362	309
floccosum . .	251	81	Carpomitra Cabrerae	22	14
floridulum .	275	120	Catenella Opuntia	214	88
gracillimum	269	5	Ceramium acanthonotum .	237	140
Hookeri . . .	260	279	botryocarpum . .	227	215

	Syn.	Plate.		Syn.	Plate.
<i>Ceramium ciliatum</i>	238	139	<i>Cladophora repens</i>	290	236
<i>decurrens</i>	228	276	<i>Rudolphiana</i>	302	86
<i>Deslongchampii</i>	229	219	<i>rupestris</i>	297	180
<i>diaphanum</i>	230	193	<i>uncialis</i>	306	207
<i>echionotum</i>	236	141	<i>Cladostephus spongiosus</i>	71	138
<i>fastigiatum</i>	234	255	<i>verticillatus</i>	70	33
<i>flabelligerum</i>	235	144	<i>Codium adhærens</i>	281	35
<i>gracillimum</i>	231	206	<i>amphibium</i>	282	35
<i>nodosum</i>	233	90	<i>Bursa</i>	280	290
<i>rubrum</i>	226	181	<i>tomentosum</i>	283	93
<i>strictum</i>	232	334	<i>Conferva ærea</i>	324	99
<i>Chondrus crispus</i>	197	63	<i>arenicola</i>	316	354
<i>Norvegicus</i>	198	187	<i>arenosa</i>	317	54
<i>Chorda filum</i>	30	107	<i>bangioides</i>	326	268
<i>lomentaria</i>	31	285	<i>clandestina</i>	328	
<i>Chordaria divaricata</i>	52	17	<i>collabens</i>	325	327
<i>flagelliformis</i>	51	111	<i>implexa</i>	322	54
<i>Chrysomenia clavellosa</i>	140	114	<i>Linum</i>	319	150
<i>rosea</i>	141	301	<i>litorea</i>	318	333
<i>Chylocladia articulata</i>	146	283	<i>Melagonium</i>	323	99
<i>kaliformis</i>	143	145	<i>sutoria</i>	320	150
<i>ovalis</i>	142	118	<i>tortuosa</i>	321	54
<i>parvula</i>	145	210	<i>Youngana</i>	327	328
<i>reflexa</i>	144	42	<i>Corallina elongata</i>	148	
<i>Cladophora albida</i>	304	275	<i>officinalis</i>	147	222
<i>arcta</i>	307	135	<i>squamata</i>	149	201
<i>Balliana</i>	301	356	<i>Crouania attenuata</i>	222	106
<i>Brownii</i>	289	30	<i>Cruoria pellita</i>	215	117
<i>diffusa</i>	295	130	<i>Cutleria multifida</i>	32	75
<i>falcata</i>	309	216	<i>Cystoseira barbata</i>	6	360
<i>flavescens</i>	312	298	<i>ericoides</i>	4	265
<i>flexuosa</i>	299	353	<i>fibrosa</i>	8	133
<i>fracta</i>	313	294	<i>fœniculacea</i>	7	122
<i>Gattyæ</i>	311	355	<i>granulata</i>	5	60
<i>glaucescens</i>	308	196	<i>Dasya arbuscula</i>	132	224
<i>gracilis</i>	300	18	<i>coccinea</i>	130	253
<i>Hutchinsiae</i>	294	124	<i>ocellata</i>	131	40
<i>lætevirens</i>	298	190	<i>venusta</i>	133	225
<i>lanosa</i>	305	6	<i>Delesseria alata</i>	165	247
<i>Macallana</i>	293	84	<i>angustissima</i>	166	83
<i>Magdalenæ</i>	310	355	<i>Hypoglossum</i>	167	2
<i>nuda</i>	296	351	<i>ruscifolia</i>	168	26
<i>pellucida</i>	291	174	<i>sanguinea</i>	163	151
<i>rectangularis</i>	292	12	<i>sinuosa</i>	164	259
<i>refracta</i>	303	24	<i>Desmarestia aculeata</i>	18	49

	Syn.	Plate.		Syn.	Plate.
<i>Desmarestia ligulata</i>	17	115	<i>Fucus serratus</i>	12	47
<i>viridis</i>	19	312	<i>vesiculosus</i>	10	204
<i>Dictyosiphon fœniculaceus</i>	41	326	<i>Furcellaria fastigiata</i>	207	94
<i>Dictyota atomaria</i>	37	1	<i>Gelidium cartilagineum</i>	192	337
<i>dichotoma</i>	38	103	<i>corneum</i>	191	53
<i>Dudresnaia coccinea</i>	220	244	<i>Gigartina acicularis</i>	194	104
<i>divaricata</i>	221	110	<i>mamillosa</i>	196	199
<i>Dumontia filiformis</i>	208	59	<i>pistillata</i>	193	232
<i>Ectocarpus amphibius</i>	81	183	<i>Teedii</i>	195	266
<i>brachiatus</i>	94	4	<i>Ginannia furcellata</i>	210	69
<i>crinitus</i>	86	330	<i>Gloiosiphonia capillaris</i>	217	57
<i>distortus</i>	88	329	<i>Gracilaria compressa</i>	186	205
<i>fasciculatus</i>	83	273	<i>confervoides</i>	187	65
<i>fenestratus</i>	82	257	<i>erecta</i>	188	177
<i>granulosus</i>	92	200	<i>multipartita</i>	185	15
<i>Hincksia</i>	84	22	<i>Grateloupia filicina</i>	190	100
<i>Landsburgii</i>	89	233	<i>Griffithsia barbata</i>	242	281
<i>littoralis</i>	90	197	<i>corallina</i>	244	214
<i>longifructus</i>	91	258	<i>Devoniensis</i>	243	16
<i>Mertensii</i>	95	132	<i>equisetifolia</i>	240	67
<i>pusillus</i>	87	153	<i>secundiflora</i>	245	185
<i>siliculosus</i>	80	162	<i>setacea</i>	246	184
<i>sphaerophorus</i>	93	126	<i>simplicifilum</i>	241	287
<i>tomentosus</i>	85	182	<i>Gymnogongrus Griffithsia</i>	204	108
<i>Elachista curta</i>	61	332	<i>plicatus</i>	205	288
<i>flaccida</i>	60	260	<i>Halidrys siliquosa</i>	3	66
<i>fucicola</i>	59	240	<i>Haliseris polypodioides</i>	33	19
<i>pulvinata</i>	64	28	<i>Halymenia ligulata</i>	209	112
<i>scutulata</i>	63	323	<i>Hapalidium Phyllactidium</i>	162	166
<i>stellulata</i>	62	261	<i>Hildenbrandtia rubra</i>	161	250
<i>velutina</i>	65	28	<i>Himanthalia lorea</i>	16	78
<i>Enteromorpha clathrata</i>	335	340	<i>Hormospora ramosa</i>	388	213
<i>compressa</i>	332	335	<i>Hypnea purpurascens</i>	189	116
<i>cornucopiae</i>	330	304	<i>Iridaea edulis</i>	213	97
<i>erecta</i>	334	43	<i>Jania corniculata</i>	151	234
<i>intestinalis</i>	331	154	<i>rubens</i>	150	252
<i>Hopkirkii</i>	337	263	<i>Kallymenia Dubyi</i>	212	123
<i>Linkiana</i>	333	344	<i>reniformis</i>	211	13
<i>percursa</i>	338	352	<i>Laminaria bulbosa</i>	25	241
<i>Ralfsii</i>	339	282	<i>digitata</i>	24	223
<i>ramulosa</i>	336	245	<i>Fascia</i>	29	45
<i>Fucus canaliculatus</i>	15	229	<i>longicruris</i>	26	339
<i>ceranoides</i>	11	271	<i>Phyllitis</i>	28	192
<i>Mackaii</i>	14	52	<i>saccharina</i>	27	289
<i>nodosus</i>	13	158	<i>Laurencia caespitosa</i>	136	286

	Syn.	Plate.		Syn.	Plate.
<i>Laurencia dasyphylla</i>	138	152	<i>Ochlochæte Hystrix</i>	329	226
<i>obtusa</i>	137	148	<i>Odonthalia dentata</i>	98	34
<i>pinnatifida</i>	135	55	<i>Oscillatoria insignis</i>	377	251
<i>tenuissima</i>	139	198	<i>littoralis</i>	372	105
<i>Leathesia Berkeleyi</i>	57	176	<i>nigroviridis</i> . .	375	251
<i>tuberiformis</i> . . .	56	324	<i>spiralis</i>	374	105
<i>Lithocystis Allmanni</i>	162	166	<i>subsalsa</i>	373	
<i>Litosiphon Laminariæ</i> . . .	50	295	<i>subuliformis</i> . .	376	251
<i>pusillus</i>	49	270	<i>Padina Pavonia</i>	34	91
<i>Lyngbya Carmichaelii</i> . . .	367	186	<i>Peyssonelia Dubyi</i>	203	71
<i>Cutleriæ</i>	370	336	<i>Phyllophora Brodiaei</i>	201	20
<i>ferruginea</i>	366	311	<i>membranifolia</i> .	200	163
<i>flacca</i>	369	300	<i>palmettoides</i> .	202	310
<i>majuscula</i>	365	62	<i>rubens</i>	199	131
<i>speciosa</i>	368	186	<i>Plocamium coccineum</i> . . .	175	44
<i>Melobesia agariciformis</i> . .	155	73	<i>Polyides rotundus</i>	206	95
<i>calcareæ</i>	153	291	<i>Polysiphonia affinis</i>	123	303
<i>farinosa</i>	158	347	<i>atrorubescens</i> .	125	172
<i>fasciculata</i>	154	74	<i>Brodiaei</i>	118	195
<i>lichenoides</i>	156	346	<i>byssoides</i> . . .	129	284
<i>membranacea</i> . .	157	347	<i>Carmichaeliana</i> .	116	319
<i>polymorpha</i> . . .	152	345	<i>elongata</i>	114	292
<i>pustulata</i>	160	347	<i>elongella</i> . . .	113	146
<i>verrucata</i>	159	347	<i>fastigiata</i> . . .	127	299
<i>Mesogloia Griffithsiana</i> . .	54	318	<i>fibrata</i>	109	208
<i>vermicularis</i> . . .	53	31	<i>fibrillosa</i> . . .	117	302
<i>virescens</i>	55	82	<i>formosa</i>	107	168
<i>Microcladia glandulosa</i> . . .	225	29	<i>furcellata</i> . . .	126	7
<i>Microcoleus anguiformis</i> . .	371	249	<i>Grevillii</i>	115	
<i>Monormia intricata</i>	380	256	<i>Griffithsiana</i> .	112	228
<i>Myrionema clavatum</i>	69	348	<i>nigrescens</i> . .	122	277
<i>Leclancherii</i> . .	67	41	<i>obscura</i>	120	102
<i>punctiforme</i> . .	68	41	<i>parasitica</i> . . .	128	147
<i>strangulans</i> . .	66	280	<i>pulvinata</i> . . .	108	102
<i>Myriotrichia clavæformis</i> .	96	101	<i>Richardsoni</i> .	111	10
<i>filiformis</i> . . .	97	156	<i>simulans</i> . . .	121	278
<i>Naccaria Wigghii</i>	216	38	<i>spinulosa</i> . . .	110	320
<i>Nemaleon multifidum</i> . . .	218	36	<i>stricta</i>	107	
<i>purpureum</i> . . .	219	161	<i>subulifera</i> . .	124	227
<i>Nitophyllum Bonnemaisoni</i> .	171	23	<i>urceolata</i> . . .	106	167
<i>Gmelini</i>	172	235	<i>variegata</i> . . .	119	155
<i>Hilliæ</i>	170	169	<i>violacea</i>	115	209
<i>laceratum</i> . .	173	267	<i>Porphyra laciniata</i>	343	92
<i>punctatum</i> . .	169	202	<i>miniata</i>	344*	
<i>versicolor</i> . . .	174	9	<i>vulgaris</i>	344	211

	Syn.	Plate.		Syn.	Plate.
<i>Ptilota plumosa</i>	223	80	<i>Sphacelaria cirrhosa</i>	76	178
<i>sericea</i>	224	191	<i>filicina</i>	72	142
<i>Punctaria latifolia</i>	43	8	<i>fusca</i>	77	149
<i>plantaginea</i>	44	128	<i>plumosa</i>	75	87
<i>tenuissima</i>	45	248	<i>racemosa</i>	79	349
<i>Pycnophycus tuberculatus</i>	9	89	<i>radicans</i>	78	189
<i>Ralfsia verrucosa</i>	58	98	<i>scoparia</i>	74	37
<i>Rhizoclonium Casparyi</i>	315	354	<i>Sertularia</i>	73	143
<i>riparium</i>	314	238	<i>Sphærococcus coronopifolius</i>	184	61
<i>Rhodomela lycopodioides</i>	99	50	<i>Sphærozyga Berkeleyana</i>	384	173
<i>subfusca</i>	100	264	<i>Broomei</i>	383	173
<i>Rhodymenia bifida</i>	177	32	<i>Carmichaelii</i>	381	113
<i>ciliata</i>	181	127	<i>Ralfsii</i>	385	
<i>cristata</i>	180	307	<i>Thwaitesii</i>	382	113
<i>jubata</i>	182	175	<i>Spirulina Hutchinsiae</i>	379	
<i>laciniata</i>	178	121	<i>tenuissima</i>	378	105
<i>palmata</i>	183	217	<i>Sporochnus pedunculatus</i>	21	56
<i>Palmetta</i>	179	134	<i>Spyridia filamentosa</i>	239	46
<i>Rivularia applanata</i>	352		<i>Striaria attenuata</i>	42	25
<i>atra</i>	351	239	<i>Stenogramme interrupta</i>	176	157
<i>nitida</i>	353	68	<i>Stilophora Lyngbyæi</i>	40	237
<i>plicata</i>	350	315	<i>rhizodes</i>	39	70
<i>Rytiplhæa complanata</i>	103	170	<i>Taonia atomaria</i>	37	1
<i>fruticulosa</i>	105	220	<i>Ulva Lactuca</i>	341	243
<i>pinastroides</i>	102	85	<i>latissima</i>	340	171
<i>thuyoides</i>	104	221	<i>Linza</i>	342	39
<i>Sargassum bacciferum</i>	2	109	<i>Vaucheria marina</i>	287	350
<i>vulgare</i>	1	343	<i>submarina</i>	286	350
<i>Schizosiphon Warreniæ</i>	354	316	<i>velutina</i>	288	321
<i>Schizothrix Cresswellii</i>	355	160	<i>Wrangelia multifida</i>	247	27
<i>Seirospora Griffithsiana</i>	248	21	<i>Zonaria collaris</i>	35	359
<i>Spermosira Harveyana</i>	387	173	<i>parvula</i>	36	341
<i>litorea</i>	386	113			



Ser. MELANOSPERMEÆ.

Fam. *Fuceæ*.

PLATE CCCXLIII.

SARGASSUM VULGARE, *Ag.*

GEN. CHAR. *Fronde* furnished with distinct, stalked, nerved leaves, and simple, axillary, stalked air-vessels. *Receptacles* small, linear, tuberculated, mostly in axillary clusters, cellular, pierced by numerous pores, which communicate with immersed, spherical *conceptacles*, containing parietal *spores* and tufted *antheridia*. SARGASSUM (*Rumph.*),—a word formed from the Spanish *sargazo*, the name given by navigators to floating Sea-weed.

SARGASSUM *vulgare*; stem filiform, smooth, alternately branched; leaves linear-lanceolate or oblong-lanceolate (very variable in breadth), serrated, strongly ribbed, copiously glandular; air-vessels on compressed stalks about their own length, spherical, pointless; receptacles axillary, dichotomous, tuberculose, unarmed.

SARGASSUM *vulgare*, *Ag. Sp. Alg.* vol. i. p. 3. *Ag. Syst.* p. 293. *Grev. Alg. Brit.* p. 2. t. 2. *Hook. Br. Fl.* vol. ii. p. 264. *Harv. Man.* ed. 1. p. 17. ed. 2. p. 15. *J. Ag. Sp. Alg.* p. 342.

FUCUS *natans* (in part), *Turn. Hist.* t. 46. *Syn.* p. 48. *Sm. Eng. Bot.* t. 2114.

HAB. Cast ashore, drifted by oceanic currents from warmer latitudes. Cast on the shores of the Orkney Isles, *Dr. P. Neill*. (Near Falmouth? *Hudson*.)

GEOGR. DISTR. Atlantic Ocean, abundant on tropical and subtropical coasts. Shores of North America, as far north as Long Island Sound. Coasts of Spain and Portugal.

DESCR. *Root* a conical disc. *Fronde*s tufted, from one to three feet in length, having a leading, mostly undivided, stem set throughout with alternate, spreading branches, the lowest of which are longest. *Stem* and branches narrow, filiform or subcompressed, smooth (destitute of rough points), somewhat flexuous. *Leaves* coriaceous, an inch or two in length, from a quarter to half an inch in breadth, oblong or linear-lanceolate, sharply serrated, the surface dotted over with muciferous pores or glands, strongly nerved. *Air-vessels* spherical, about as large as a pea, pointless, borne on compressed stalks about as long as themselves, and springing from the lower part of the petiole of the leaves. *Receptacles* in dichotomous cymoid tufts, springing with the air-vessels from the petioles, cylindrical, tuberculated, usually much shorter than the subtending leaf, sometimes elongated and filiform, and many times forked. *Colour* a foxy olive. *Substance* opake and tough.

One of the stray waifs of tropical climes, which are occa-

sionally brought to our shores by the great north-eastern current of the Atlantic, and which have no proper claim to admission into our Flora. Though the present species has had a place in British works for nearly a century, I have never seen a (so called) British specimen, and have made my figure from an American example.

Fig. 1. Branch of SARGASSUM VULGARE:—*the natural size*. 2. A leaf, with vesicl and receptacles. 3. A broader leaf:—*the two last somewhat magnified*.



PLATE CIX.

SARGASSUM BACCIFERUM, *Ag.*

GEN. CHAR. *Frond* furnished with distinct, stalked, nerved *leaves*, and simple, axillary, stalked *air-vessels*. *Receptacles* small, linear, tuberculated, mostly in axillary clusters, cellular, pierced by numerous pores, which communicate with immersed, spherical *conceptacles* containing parietal *spores* and tufted *antheridia*. SARGASSUM (*Rumph.*)—a word formed from the Spanish *sargazo*, the name applied to the floating sea-weed observed by navigators.

SARGASSUM *bacciferum*; stem cylindrical, slender, much branched, flexuous; leaves linear, serrated, mostly without muciferous pores; air-vessels abundant, spherical, on cylindrical stalks, commonly mucronate.

SARGASSUM *bacciferum*, *Ag. Sp. Alg.* vol. i. p. 6. *Ag. Syst.* p. 294. *Spreng. Syst. Veg.* vol. iv. p. 320. *Grev. Alg. Brit.* p. 3. *Hook. Br. Fl.* vol. ii. p. 264. *Harv. Man.* p. 17.

FUCUS *bacciferum*, *Turn. Hist.* t. 47. *Sm. E. Bot.* t. 1967.

FUCUS *natans*, *Esper, Ic.* vol. i. p. 49. t. 23.

FUCUS *sargasso*, *Gmel. Hist. Fuc.* p. 92.

HAB. Occasionally cast on the British coasts, but not a native of our waters. Orkney Islands, *Dr. P. Neill*. Shore of Castle Eden Dean, Durham, *Mr. W. Backhouse*.

GEOGR. DISTR. Tropical and sub-tropical ocean, throughout both hemispheres, always found floating on the surface of the sea.

DESCR. *Fronds* a foot or more in length. *Stems* growing in all directions from a central point, forming globular, floating tufts, cylindrical, filiform, slender, flexuous or angularly bent, twice or thrice divided; *branches* long, simple, alternate, flexuous, pinnated with alternate leaves. *Leaves* two to three inches long, one to two lines wide, linear-lanceolate, tapering to either extremity, destitute of muciferous pores, serrato-dentate, with irregularly distant divaricating sharp teeth, furnished with a strong, percurrent midrib. *Vesicles* spherical, with or without a mucro, borne on short, cylindrical stalks in the axils of the leaves, one or more in each axil. *Fructification* unknown. *Colour*, when growing, a pale transparent greenish olive; when dry, dark brown or black. *Substance* between cartilaginous and coriaceous, brittle when recent.

This plant, the well-known *Sargasso* or gulf-weed, has clearly no claims to be admitted to the British Flora, but having already been introduced into other works, I figure it, though obliged to make my drawing, from a foreign specimen.

The branch shown in the figure is part of a specimen picked

up at sea, in the great floating bank of gulf-weed which extends at the westward of the Azores from the twentieth to thirty-sixth degree of north latitude. Another similar, but smaller bank, occurs, according to Humboldt, a short way west of the Bahamas, and between the twenty-second and twenty-sixth degrees of latitude. From the first of these, probably, the specimens which occasionally reach the British coasts, are detached and carried northward by the great current that sweeps along the eastern shores of the American continent, and crossing the Atlantic in a high latitude, at length dissipates itself on the northern coasts of Europe. The *Sargasso* is not the only vegetable production which it brings to Shetland and Orkney. Tropical woods, and seeds are still more frequently brought, and occur all along the west of Ireland, where yet I have never known an instance of *Sargassum* having been found.

Sargassum bacciferum has been observed in the most distant parts of the Atlantic and Pacific Oceans, throughout the tropics and within a moderate distance of them, and always floating; it is therefore unfortunate that the ancient name *natans*, has not been preserved to this species, to which it is most applicable. In the great Atlantic bank it is found in ridges from ten to twenty yards wide, and of indefinite length, stretching across the sea. In this situation it continues to grow luxuriantly, and appears to multiply itself by off-sets, at first accidentally broken off, and immediately establishing themselves as independant plants. A great variety of marine animals from *Crustacea*, downwards, inhabit its branches, but I observed no parasitical Algæ on any of the specimens picked up. The list of animal species would afford subject for a small volume, but very few of them are of a strictly parasitical nature.

Fig. 1. SARGASSUM BACCIFERUM; a branch:—of the natural size. 2. A leaf and mucous vesicle. 3. A mucronate vesicle:—slightly magnified.



PLATE LXVI.

HALIDRYS SILIQUOSA, *Lyngb.*

GEN. CHAR. *Frond* compressed, linear, pinnated with distichous branches. *Air-vessels* lanceolate, stalked, divided into several cells by transverse partitions. *Receptacles* terminal, stalked, cellular, pierced by numerous pores, which communicate with immersed spherical *conceptacles*, containing parietal *spores* and tufted *antheridia*. HALIDRYS (*Lyngb.*) —from *άλς*, the sea, and *δρῦς*, an oak.

HALIDRYS *siliquosa*; branches linear, very narrow; air-vessels compressed, linear-lanceolate, slightly constricted at the septa, mucronate.

HALIDRYS *siliquosa*, *Lyngb. Hyd. Dan.* p. 37. *Grev. Alg. Brit.* p. 9. t. 1. *Hook. Brit. Fl.* vol. ii. p. 266. *Wyatt, Alg. Danm.* no. 53. *Harv. in Mack. Fl. Hib.* part 3. p. 168. *Harv. Man.* p. 19. *Endl. 3rd Suppl.* p. 30.

CYSTOSEIRA *siliquosa*, *Ag. Sp. Alg.* vol. i. p. 72. *Ag. Syst.* p. 287. *Spreng. Syst. Veg.* vol. iv. p. 317. *Grev. Fl. Edin.* p. 285.

FUCUS *siliquosus*, *Linn. Sp. Pl.* p. 1829. *Syst. Nat.* vol. ii. p. 716. *Fl. Lapp.* p. 365. *Gm. Hist.* p. 81. t. 2. B. *Fl. Dan.* t. 106. *Huds. Fl. Ang.* p. 574. *Lightf. Fl. Scot.* vol. ii. p. 921. *With.* vol. iv. p. 88. *Good. and Woodw. in Linn. Trans.* vol. iii. p. 124. *E. Bot.* t. 474. *Stack. Ner. Brit.* p. 8. t. 5. *Turn. Syn.* vol. i. p. 60. *Hist.* t. 159. *Esper, Ic. Fuc.* t. 8.

FUCUS *siliculosus*, *Stack. Ner. Brit.* t. 11.

HAB. On rocks and stones in the sea, at and below half tide level. Perennial. Winter and Spring. Common on the shores of the British Islands.

GEOGR. DIST. North Sea, and Northern Atlantic.

DISTR. *Root*, a large, conical disc. *Fronds*, from one to four feet long or more, linear, compressed, two-edged, from one to two lines in breadth, flexuous, mostly undivided, distichously pinnate or bi-pinnate. *Pinnæ* alternate, erectopatent, issuing with an obtuse axil; the lower ones much lengthened, and either naked below, or furnished with a few small branchlets and air-vessels, pinnate, or bi-pinnate above, the smaller divisions set with alternate vesicles or with receptacles; the upper pinnæ gradually shorter, more simple, and better furnished than the lower, and generally terminating in racemes either of vesicles or of receptacles. *Air-vessels* linear, oblong, or lanceolate, supported on slender stalks, and tipped by a linear mucro of various length, from a quarter inch to an inch and a half, and which sometimes bears at its apex a receptacle. The air-vessels are externally marked with transverse, constricting lines, very visible when dry, which correspond to internal septa dividing the hollow inside into numerous distinct chambers, through which run several longitudinal threads. *Receptacles* either forming racemes at the apices of the branches, or terminating the mucrones of the vesicles, lanceolate, subacute, on short stalks, distichous, compressed, furnished with

numerous pores communicating with the immersed *conceptacles* or spore-chambers. These latter are spherical, and contain numerous oblong, simple, dark-brown spores, mixed with tufts of branching filaments bearing bright orange *antheridia*. Colour, when young, a greenish olive, in age becoming a rich brown. Substance very tough and leathery.

One of the handsomest of the British *Fuceæ* and common on all our shores. It is subject to little variation, except in size. When growing in shallow water, or in tide pools near high water mark, it becomes stunted in its habit, having the branches more closely set, and bushy, and every part proportionably smaller and narrower. This state constitutes the var. β . of authors.

The genus *Halidrys*, founded by Lyngbye, is well distinguished from all other *Fuceæ* by the curious structure of its air-vessels. These compound air-vessels are confined to the present individual, and to the beautiful *Fucus osmundaceus* of Turner, a native of the West coast of North America. In this latter species the structure is slightly different, and the vesicles are much constricted at the joints, like strings of beads. The whole habit, however, is so very similar to that of our *H. siliquosa*, that I cannot but consider it as properly a member of the same natural genus.

Fig. 1. HALIDRYS SILIQUOSA ; Portion of a branch :—*the natural size*. 2. Longitudinal section of an air-vessel. 3. Transverse section of a *receptacle*, with its immersed *conceptacles*, containing spores and antheridia. 4. Spores :—*all more or less magnified*.



PLATE CCLXV.

CYSTOSEIRA ERICOIDES, *Ag.*

GEN. CHAR. *Fron*d much branched, occasionally leafy at the base; *branches* becoming more slender upwards, and containing strings of simple air-vessels within their substance. *Receptacles* terminal, small, cellular, pierced by numerous pores, which communicate with immersed, spherical *conceptacles*, containing parietal *spores* and tufted *antheridia*. CYSTOSEIRA (*Ag.*),—from *κυστις*, a *bladder*, and *σειρα*, a *chain*; because the air vessels are often arranged in strings.

CYSTOSEIRA *ericoides*; stem thick, woody, short, cylindrical, beset with numerous, slender, filiform branches, variously divided, and densely clothed with small, spine-like, awl-shaped ramuli; air-vessels small, solitary beneath the apices of the branches; receptacles cylindrical, armed with awl-shaped processes.

CYSTOSEIRA *ericoides*, *Ag. Sp. Alg.* vol. i. p. 52. *Ag. Syst.* p. 281. *Spreng. Syst. Veg.* vol. iv. p. 316. *Grev. Alg. Brit.* p. 4. *Hook. Br. Fl.* vol. ii. p. 265. *Harv. in Mack. Fl. Hib.* part 3. p. 167. *Harv. Man.* p. 18. *Endl. 3rd Suppl.* p. 30. *J. Ag. Gen. et Sp. Alg.* vol. i. p. 221.

HALERICA *ericoides*, *Kütz. Phyc.* p. 354.

FUCUS *ericoides*, *Sp. pl.* p. 1631. *Good. and Wood. in Linn. Trans.* vol. iii. p. 130. *E. Bot.* t. 1968. *Turn. Hist.* t. 191.

FUCUS *tamariscifolius*, *Huds. Fl. Ang.* p. 576. *Stack. Ner. Brit.* p. 44. t. 11. *Turn. Syn. Fuc.* p. 88. (*excl. syn. Gmel.*)

FUCUS *selaginoides*, *Esper, Ic. Fuc.* vol. i. p. 69. t. 31. (*excl. syn. Gmel.*) *Good. and Wood. Linn. Trans.* vol. iii. p. 132. *Turn. Syn.* p. 85.

HAB. On marine rocks, near low-water mark and in tide-pools. Perennial. Summer and autumn. Frequent on the shores of the south of England and south and west of Ireland. Yarmouth Reach, *Mr. Turner*. Port Rush, Antrim, *Mrs. Ovens*.

GEOGR. DISTR. On the Atlantic shores of Europe and the north of Africa.

DESCR. *Root* a large conical or flattened disc. *Fron*d generally solitary, twelve to eighteen inches in length, rising with a cylindrical stem nearly half an inch in diameter. This stem is four to six inches long, and either simple or forked, or having four or five main divisions, which support numerous slender, crowded, bitripinnated branches. *Branches* as thin as whip-cord, decomposed, all the divisions alternate and distichous, densely set with short, spine-like ramuli or leaves, each of which has a gland-like pore on its back, near the base. *Air vessels* few and small, oblong, placed usually in the terminal branchlets just below the base of the receptacle. *Receptacles* formed in the apices of all the branches, oblong, cylindrical, becoming nodose, always armed with spine-like ramuli, similar to those that clothe the branches. *Spores* obovate, with wide borders. When growing, under water, the frond reflects beautiful prismatic colours, which are lost when it is lifted into the air:—the colour is then a yellowish olive. On being dried the frond turns black, and shrinks considerably. *Substance* tough and leathery.

This is one of the most beautiful of the British species of *Cystoseira*, especially when seen growing under water. It then appears clothed with the richest tints of blue and green, more like those phosphorescent gleams that flash from the lower marine animals than any vegetable colours. As each twig waves to and fro in the water the hues vary, and sometimes, when the light falls partially on a branch, some portions seem covered with sky-blue flowers, while others remain dark. All these beautiful tints perish when the plant is removed from the water. The specific name *ericoides*, or heath-like, alludes both to the brilliant colouring and the shrubby character of the frond, which is covered with small ramuli resembling the leaves of a heath.

C. ericoides is common on the southern shores of our islands, and becomes gradually less frequent towards the north. It has been once found on the coast of Ayrshire by the Rev. D. Landsborough.

Fig. 1. *CYSTOSEIRA ERICOIDES* :—*of the natural size*. 2. Receptacle and vesicle, both formed in the apex of a branch. 3. Section of a conceptacle, showing the spores and antheridia. 4. A spore :—*all more or less magnified*.



PLATE LX.

CYSTOSEIRA GRANULATA, *Ag.*

GEN. CHAR. *Frond* much branched, occasionally leafy at the base; *branches* becoming more slender upwards, and containing strings of simple air-vessels within their substance. *Receptacles* terminal, small, cellular, pierced by numerous pores, which communicate with immersed spherical *conceptacles*, containing parietal *spores* and tufted *antheridia*. CYSTOSEIRA (*Ag.*)—from κύστις, a *bladder*, and σείρά, a *chain*; because the air vessels are generally arranged in strings.

CYSTOSEIRA *granulata*; stem cylindrical, covered with elliptical knobs, each of which bears a slender, repeatedly divided, dichotomo-pinnate, filiform branch, irregularly set with scattered, awl-shaped, thorn-like ramuli; air vessels small, two or three together in the upper part of the branches; receptacles elongated.

CYSTOSEIRA *granulata*, *Ag. Sp. Alg.* vol. i. p. 55. *Syst.* p. 282. *Grev. Fl. Edin.* p. 285. *Grev. Alg. Brit.* p. 5. t. 2. *Hook. Br. Fl.* vol. ii. p. 265. *Harv. in Mack. Fl. Hib.* part 3. p. 167. *Wyatt, Alg. Danm.* no. 101. *Harv. Man.* p. 18. *Endl. 3rd Suppl.* p. 30.

FUCUS *granulatus*, *Lin. Sp. Pl.* p. 1629. *Fl. Dan.* t. 591. *Turn. Hist.* t. 251. *E. Bot.* t. 2169. *Hook. Fl. Scot.* part 2. p. 94. *Lyngb. Hyd. Dan.* p. 58.

FUCUS *concatenatus*, *Lin. Sp. Pl.* p. 1629. *Huds. Fl. Ang.* p. 574. *Lightf. Fl. Scot.* vol. ii. p. 923. *Clem. Ess.* p. 310. *Velley, Pl. Mar.* t. 2. f. 1.

FUCUS *mucronatus*, *Turn. Syn.* vol. i. p. 78.

FUCUS *nodicaulis*, *With.* vol. iv. p. 111.

PHYLLACANTHA *Boryana* (?), *Kütz. Phyc. Gen.* p. 355 (and probably several other species of *Phyllacantha*, *Kütz.*).

HAB. In rocky basins left by the tide, at and below half-tide level. Perennial. Summer. Not uncommon on the shores of England and Ireland. Aberfraw, *Mr. Ralfs*. Rare in Scotland? Jersey, *Miss White*.

GEOGR. DISTR. Shores of Europe from Norway to Spain.

DESCR. *Root* a depressed, conical disc. *Stem* cylindrical, two to four lines in diameter, and from two to ten inches in length, more or less densely covered with quadrifarious, elliptical knobs, each of which produces a branch, several inches to a foot or more in length. *Branches* filiform, slender, much divided in a manner between dichotomous and alternately pinnate; the smaller branches twice or thrice compound. *Air-vessels* innate in the branches, often below an axil, or two or three together in the alternate branchlets, elliptic-oblong. *Axils* obtuse. *Ramuli* scattered along the receptacles and branches, small, spine-like, acute. *Receptacles* lanceolate, unequally tubercled. *Substance* leathery, horny when dry. *Colour* a clear olive-green, in age becoming brown or foxy.

From the other British species of *Cystoseira*, except from *C. barbata*, which has probably no claim to be admitted as British, *C. granulata* may be readily known by the knob-like bases of its branches, a character at all times obvious. Like its congeners it is exceedingly bushy, forming a submarine shrub, and I have been forced, in making such a figure as would detail its botanical characters, to represent a specimen with most of its branches cut off. Had I attempted more, it would only have produced a confused mass of twigs.

C. granulata is of frequent occurrence on the shores of England and of Ireland, but appears to be rare in Scotland. It generally grows in a very scattered manner, but is sometimes gregarious. Like others of the genus its stems afford a grateful resting place to a host of marine animals, sponges, &c., and are often completely clothed with a thick incrustation of animal life. However annoying this may be to the collector of specimens, who can rarely, if ever, find a clean-stemmed *Cystoseira*, it must be admitted that these parasites add much to the picturesque beauty of a *Cystoseira* grove, their brilliant colours and starry forms looking like clusters of flowers peeping out from the branches. When seen, under a favourable light, in a clear tide-basin, the effect is highly beautiful.

The genus *Cystoseira*, in its most restricted sense, even after the removal of the extensive group now forming *Blossevillea*, Dne., still contains a considerable number of species, natives, for the most part, of the warmer regions of the temperate zones. Many are found in the Mediterranean; indeed, the greater part of the *Fuceæ* found in that sea belong to this genus. They are intermediate, as well in geographical position as in distinctive character, between the tropical *Sargassa*, which they resemble in the *structure* of their fruit, and in habit; and the *Fuci* of colder waters, with which they agree in the *position* of the fruit and vesicles. Through *Blossevillea* there is a direct passage into *Sargassum*; the connection with *Fucus* is more remote, and runs through some minor genera, natives of the Southern Ocean.

Fig. 1. CYSTOSEIRA GRANULATA:—*natural size*. 2. Section of a receptacle:—*magnified*. 3. Spore:—*highly magnified*.



PLATE CCCLX.

CYSTOSEIRA BARBATA, *Ag.*

GEN. CHAR. *Frond* much branched, occasionally leafy at the base; *branches* becoming more slender upwards, and containing strings of simple air-vessels within their substance. *Receptacles* terminal, small, cellular, pierced by numerous pores, which communicate with immersed, spherical *conceptacles*, containing parietal *spores*, and tufted *antheridia*. CYSTOSEIRA (*Ag.*),—from *κυστις*, a bladder, and *σειρα*, a chain; because the air-vessels are often arranged in strings.

CYSTOSEIRA *barbata*; stem cylindrical, covered with small, elliptical knobs, each of which bears a very slender, many times dichotomo-pinnated, filiform branch; air-vessels lanceolate, one or two together; receptacles small, elliptic-oblong, mucronate.

CYSTOSEIRA *barbata*, *Ag. Sp. Alg.* vol. i. p. 57; *Syst.* p. 283. *Grev. Alg. Brit.* p. 6. *Hook. Br. Fl.* vol. ii. p. 265. *Harv. Man.* ed. 1. p. 18; ed. 2. p. 17. *J. Ag. Sp. Alg.* vol. i. p. 223.

FUCUS *barbatus*, *Good. et Woodw. Linn. Trans.* vol. iii. p. 128. *Turn. Syn.* p. 80; *Hist.* t. 250. *Sm. E. Bot.* t. 2170. *Stack. Ner. Brit.* p. 83. t. 14.

FUCUS *fœniculaceus*, *Gm. Hist.* t. 2 A. f. 2 (!). *Huds. Fl. Ang.* p. 575.

HAB. Rocks between tide-marks. Said to have been gathered by Hudson in Devonshire; but has not been recently found.

GEOGR. DISTR. In the Mediterranean, Adriatic, and Black Seas. Brest, fide *Lenormand*.

DESCR. *Stem* about as thick as a swan's quill, simple or branched, truncate, densely clothed with lateral branches. *Branches* rising from slightly incrassated bases, filiform, very slender, unarmed, decompound, repeatedly pinnate, the lesser divisions dichotomous. *Vesicles*, when present, numerous, elongate, ellipsoidal or lanceolate, two or more together forming a chain in the branch. *Receptacles* terminating the dichotomous ramuli linear, of small size, 1–2 lines long, or rarely 3–4 lines, tuberculated, unarmed, or rarely with one or two spine-like processes, mucronate; the mucro subulate. *Colour* brownish-olive, becoming very dark in drying.

The figure here given has been prepared chiefly from a specimen collected at Catania in Sicily, and given me, many years ago, by Professor Gussone. I have seen no British specimen, nor am I aware that any authentic evidence is on record of the finding of this plant on the British coast, although it is mentioned

as an undoubted native of Devonshire by Hudson, Stackhouse, and other early writers on these plants. Hudson says of it, "in *Devonia passim*," and Stackhouse gives "Devonshire and S.W. coast" as the station, but adds, "This species is rare, and has occasioned mistakes among our English botanists, who, after the example of Gmelin, have given it the trivial name of *F. fœniculaceus*, which appears, by the Linnæan herbarium, to be a very different species," &c. Both these authors quote Gmelin's figure, which, Turner observes, "is so characteristic" of his *F. barbatus* "as to take away all doubts as to the species." The last-named author, however, adds, "How far *F. barbatus* is really entitled to a place in the British Flora I own I entertain much doubt. I never saw a specimen gathered on our shores; and in Devonshire, where Hudson is stated to have gathered it, I have been fortunate enough to enjoy the advantage of correspondents, who would have been little likely to have left it unnoticed." This was written upwards of thirty years ago, since which time no part of England has been more zealously or more successfully explored (as these volumes bear ample evidence) than the coasts of Devonshire and Cornwall, but no one has met with a scrap of this plant; wherefore I fear it is but too evident that it has no claim to a place in this work.

Fig. 1. *CYSTOSEIRA BARBATA*; branch:—*the natural size*. 2. Dichotomous ramulus:—*magnified*. 3. A receptacle and air-vessel:—*rather more magnified*.



PLATE CXXII.

CYSTOSEIRA FÆNICULACEA, *Grev.*

GEN. CHAR. *Frond* much branched, occasionally leafy at the base; *branches* becoming more slender upwards, and containing strings of simple air-vessels within their substance. *Receptacles* terminal, small, cellular, pierced by numerous pores, which communicate with immersed, spherical *conceptacles*, containing parietal *spores*, and tufted *antheridia*. CYSTOSEIRA (*Ag.*),—from κύστις, a *bladder* and σείρα, a *chain*; because the air-vessels are often arranged in strings.

CYSTOSEIRA *fæniculacea*; stem compressed; branches long, slender, rough with hard points, repeatedly dichotomo-pinnate; air-vessels small, solitary or two together, elliptical oblong, placed near the tips of the branches; receptacles minute, smooth, linear-lanceolate.

CYSTOSEIRA *fæniculacea*, *Grev. Alg. Brit.* p. 6. *Hook. Br. Fl.* vol. ii. p. 265. *Wyatt, Alg. Danm.* no. 51. *Harv. Man.* p. 18.

CYSTOSEIRA *discors*, *Ag. Sp. Alg.* vol. i. p. 62. *Ag. Syst.* p. 284. *Spreng. Syst. Veg.* vol. iv. p. 317. *J. Ag. Alg. Medit.* p. 51. *Endl. 3rd Suppl.* p. 30. *Menegh. Alg. Ital. and Dalm.* vol. i. p. 83. *Mont. Fl. Alger.* p. 17. *Kütz. Phyc. Gen.* p. 358.

CYSTOSEIRA *abrotanifolia*, *Ag. Sp. Alg.* vol. i. p. 63. *Ag. Syst.* p. 284. *Spreng. Syst. Veg.* vol. iv. p. 317. *J. Ag. Alg. Medit.* p. 52. *Endl. 3rd Suppl.* p. 30. *Menegh. Alg. Ital. and Dalm.* vol. i. p. 92. *Mont. Fl. Alger.* p. 19. *Kütz. Phyc. Gen.* p. 357.

FUCUS *fæniculaceus*, *Linn. Sp. Pl.* p. 1629. *Turn. Hist.* p. 252.

FUCUS *discors*, *Linn. Syst. Nat.* p. 717. *Turn. Syn.* p. 70. *Esper, Ic.* t. 26. *Stack. Ner. Brit.* t. 17. *E. Bot.* t. 2131. *Lamour. Ess.* p. 17.

FUCUS *abrotanifolius*, *Linn. Sp. Pl.* p. 1629. *Huds. Fl. Angl.* p. 575. *Stack. Ner. Brit.* p. 86. t. 14. *Turn. Syn.* p. 66. *E. Bot.* t. 2130. *Lamour. Ess.* p. 18.

HAB. Growing on rocks, in tide pools, near low-water mark. Perennial. Summer. Southern shores of England, in several places. Sussex, *Hudson*. Sidmouth and Torquay, *Mrs. Griffiths*. Weymouth and Isle of Wight, *Stackhouse*. Jersey, *Miss White and Miss Turner*.

GEOGR. DISTR. Atlantic shores of England, from the south of England to Spain. Mediterranean Sea.

DESCR. *Root* a thick, hard, conical disc. *Fronds* one to two feet long, much branched. *Stem* four to six inches long, as thick as a goose quill, rough in the upper part, with spine-like prominences. *Branches* numerous, lateral, alternate, one to two feet long, filiform, rough with spinous processes, especially below; the older ones naked at base, pinnated above, with an ovate outline. *Pinnæ* twice or thrice divided in a mixed alternate and dichotomous manner, slender, containing small, elliptical air-vessels below their forkings. The branches of young plants, and occasionally of the

younger parts of the stem in old plants, are flat and leaf-like, bi-pinnate; the pinnules furnished with a midrib, and muciferous pores, with a crenate or subdentate margin, and varying from a line to two or three lines in breadth. *Receptacles* one or two lines long, simple or forked, smooth, subtorulose, lanceolate, terminating most of the upper pinnæ of fertile specimens, and frequently subtended by vesicles. *Colour* dark in the stem; a pale olive in the branches. *Substance* between coriaceous and cartilaginous, brittle when dry.

I follow Turner, and all succeeding British writers, in uniting, under the common name *fœniculacea*, the *Fucus discors* and *F. abrotanifolius* of Linnæus, which continental authorities, without exception, retain in the rank of species. So far as a judgment may be correctly formed from dried specimens, I fully agree with Mr. Turner, that "each shape passes into the other by gradations so imperceptible that no line can be drawn between them"; and this excellent author further remarks, that in separating it into distinct varieties, he has rather yielded to the feeling of weakness than followed the dictates of his judgment; fearing that if he did otherwise, he might be accused of presumption, or even of a worse motive, in refusing to find characters sufficient even for varieties, where other botanists have had no hesitation in laying down such as constitute species. I have not myself had much opportunity of examining the living plant, but I place implicit reliance on the accuracy of the observations made during many years familiarity with this species, by my often mentioned friend Mrs. Griffiths, who states that such specimens as grow in deep water, where they are seldom or never exposed by the tides, constitute the *F. discors* of authors, especially if collected in summer, at which season they are extremely luxuriant, with broad leaves and large air-bladders; and that fronds which are developed in shallow tide-pools, or collected late in autumn or winter, being more branched, and having narrower leaves, make the *F. abrotanifolius*. On the depth of water, or difference of season, therefore, depend all the characters on which it has been attempted to erect two species.

CYSTOSEIRA FÆNICULACEA :—*of the natural size.* 2. Portion of a leafy branchlet.
3. Air-vessels and receptacles. 4. Transverse section of a receptacle :—
more or less magnified.



PLATE CXXXIII.

CYSTOSEIRA FIBROSA, *Ag.*

GEN. CHAR. *Frond* much branched, occasionally leafy at the base; *branches* becoming more slender upwards, and containing strings of simple air-vessels within their substance. *Receptacles* terminal, small, cellular, pierced by numerous pores, which communicate with immersed, spherical *conceptacles*, containing parietal *spores*, and tufted *antheridia*. CYSTOSEIRA (*Ag.*),—from κύστις, a bladder and σείρα, a chain; because the air-vessels are often arranged in strings.

CYSTOSEIRA *fibrosa*; stem woody, compressed, very much branched; branches slender, alternately bi-tri-pinnate, pinnules furnished with linear, setaceous, acute ramuli; vesicles elliptical, solitary or in pairs, immersed in the smaller branches, remote from the apices; receptacles linear, very long, more or less clothed with setaceous ramuli.

CYSTOSEIRA *fibrosa*, *Ag. Sp. Alg.* vol. i. p. 65. *Ag. Syst.* p. 285. *Spreng. Syst. Veg.* vol. iv. p. 317. *Grev. Alg. Brit.* p. 8. *Hook. Br. Fl.* vol. ii. p. 266. *Harv. in Mack. Fl. Hib.* part 3. p. 168. *Harv. Man.* p. 19. *Wyatt, Alg. Danm.* no. 52. *Endl. 3rd Suppl.* p. 30. *Fl. Dan.* t. 1902.

PHYLLACANTHA *fibrosa*, *Kütz. Phyc. Gen.* p. 356.

FUCUS *fibrosus*, *Huds. Fl. Ang.* p. 575. *Good. and Woodw. in Linn. Trans.* vol. iii. p. 137. *With.* vol. iv. p. 87. *Stack. Ner. Brit.* p. 80. t. 14. *Turn. Syn.* vol. i. p. 93. *Turn. Hist.* t. 209. *E. Bot.* t. 1969. *Lamour. Ess.* p. 18.

FUCUS *abrotanoides*, *Gmel.* p. 89. *Esper*, p. 65. t. 29.

FUCUS *baccatus*, *Gmel.* p. 90. t. 3. f. 2. *Esper, Ic.* p. 108. t. 54.

FUCUS *setaceus*, *Huds. Fl. Ang.* p. 575.

HAB. On rocks, near low-water mark and in tide-pools; also in 4–15 fathom water. Perennial. Summer. Frequent on the shores of England and of the north, west, and south of Ireland. Not found in Scotland.

GEOGR. DISTR. Atlantic shores of Europe, from England to Spain.

DESCR. *Root* a large, hard, conical expansion. *Fronds* mostly solitary, from two to three feet long, or more, very bushy, and excessively branched. *Main stem* as thick as a swan's quill, simple, or once or twice branched, from six inches to a foot in length, furnished throughout with alternate, subdistichous slender branches, accompanied by more or less numerous, linear, simple or forked, narrow leaves, which are furnished with a mid-rib and attenuated to each extremity. *Branches* from one to two feet in length, as thick as small twine, somewhat compressed, gradually attenuated from the base to the apex, but without any swelling at the base, more or less naked below, and rough with the remains of broken ramuli, closely pinnated above with alternate, distichous branchlets, which in like manner are pinnated with a second, and these with a third series of branchlets,

gradually becoming smaller and more slender. In the last series, which are more or less clothed with setaceous simple or forked ramuli, from a quarter inch to upwards of an inch in length, are imbedded one or two elliptical vesicles from one to two lines in diameter. The receptacles terminate most of the lesser branches of fertile specimens, and are often much produced: when young, they are clothed with setaceous ramuli, exactly as the barren pinnules, but become more or less naked in an advanced state, and at length torulose. They contain numerous conceptacles, of the usual structure. *Substance* woody in the stem, coriaceous and tough in the branches. *Colour* a yellowish olive green, becoming black in drying.

This is the largest and finest of the British *Cystoseiræ*, and when grown under circumstances favourable to its full development, it is a very handsome plant. Our figure represents only the lower part of a stem, and one of the branches. To do full justice to the frond would require a folio plate.

The principal stem near its base, and some of the lower branches, which are shorter and more simple than the rest, produce numerous simple or forked linear, mid-ribbed leaves, one of which is represented at fig. 2. These are borne nearly in the order of the usual ramuli, but sometimes more densely inserted, and almost fasciculate.

From *C. ericoides*, with which only among British species it can be confounded, *C. fibrosa* may always be known by its more slender branches, the large size of its air-vessels, and the very long, filiform receptacles clothed with setaceous ramuli; nor does it exhibit, when growing, those brilliant rainbow tints for which *C. ericoides* is so remarkable. It is by no means so commonly clothed with animal parasites as our other species, but is frequently infested with *Elachistea flaccida*, a plant which I believe to be peculiar to it.

Fig. 1. CYSTOSEIRA FIBROSA. 2. One of the leaves:—*both of the natural size.*
3. Receptacles and vesicle:—*slightly magnified.*



PLATE LXXXIX.

PYCNOPHYCUS TUBERCULATUS, *Kütz.*

GEN. CHAR. *Root* composed of branching fibres. *Fronde* cylindrical, dichotomous. *Air-vessels*, when present, innate, simple. *Receptacles* terminal, cellular, pierced by numerous pores, which communicate with immersed, spherical *conceptacles*, containing, in the lower part of the receptacles, parietal, simple *spores*, and in the upper, tufted *antheridia*.
 PYCNOPHYCUS (*Kütz.*),—from πυκνός, *thick*, and φῦκος, a *sea-weed*.

PYCNOPHYCUS tuberculatus.

PYCNOPHYCUS tuberculatus, *Kütz. Phyc. Gen.* p. 359 (1843).

CYMA DUSE tuberculata, *Dne. Ann. Sc. Nat.*, 1845. p. 12.

FUCUS tuberculatus, *Huds. Fl. Ang.* p. 588. *Good. and Woodw. in Linn. Trans.* vol. iii. 198. *Turn. Syn. Fuc.* vol. ii. p. 505. *Turn. Hist.* t. 7. *Esper, Ic. Fuc.* vol. ii. p. 20. t. 121. *E. Bot.* t. 726. *Lamour. Ess.* p. 20. *Stack. Ner. Brit.* append. *Ag. Sp. Alg.* vol. i. p. 98. *Ag. Syst.* p. 279. *Spreng. Syst. Veg.* vol. iv. p. 316. *Grev. Alg. Brit.* p. 18. *Hook. Br. Fl.* vol. ii. p. 269. *Harv. in Mack. Fl. Hib.* part 3. p. 169. *Harv. Man.* p. 21. *Wyatt, Alg. Danm.* no. 103. *Endl. 3rd Suppl.* p. 29.

FUCUS bifurcatus, *With.* vol. iv. p. 109. t. 17. f. 1.

HAB. In rock-pools left, on the recess of the tide, near low-water mark; never growing in places which are dry at low-water. Perennial. Summer and autumn. Several places on the coast of Cornwall, *Hudson, Stackhouse, Turner, &c.* Ilfracombe, *Bishop Goodenough*. Bill of Portland, *Mr. Bryer*. North of Ireland, *Dr. Scott* (sec *Turn.*). Abundant on the west coast of Ireland, in several places, from Galway to Cork. Jersey, *Miss White* and *Miss Turner*.

GEOGR. DISTR. Atlantic shores of France and Spain. Coast of Barbary, *Web.* and *Mohr*. Cape of Good Hope, *Bowie* and *W. H. H.*

DESCR. *Root*, formed of branching fibres, which extend in patches from one to several feet in diameter, over the surface of the rock. *Fronde*s 12–20 inches long, as thick as a goose-quill, cylindrical, erect, quite simple for the distance of from four to eight inches from the root, then forked; and afterwards repeatedly, but irregularly, dichotomous, one of the arms of the fork being longer and stronger than the other, so that eventually the frond often appears as if alternately branched. *Axils* obtuse, rounded. *Vesicles* frequently absent; when present, generally innate in the ultimate branches, or immediately below one of the upper forkings. *Receptacles* terminating the branches, from a prolongation of which they are formed, simple, cylindrical, obtuse, composed internally of compact cellular tissue; the cells polygonal. They are, when ripe, tuberculated, each tubercle pierced by a pore, beneath which is placed a spherical *conceptacle*. In the lower part of the receptacle, the conceptacles contain numerous parietal, simple, elliptical spores, narrowed at their lower end; in the upper part, they are destitute of spores, but filled with tufts of branching filaments, to which *antheridia* are attached. *Colour*, when growing, a clear olive, more yellow, and semi-

transparent in the receptacles ; when dry, black. *Substance* tough, between coriaceous and cartilaginous ; brittle when dry.

There is something so peculiar in the habit of this species, so different from that of the other members of the restricted genus *Fucus*, that it seems, even at first sight, to have claims to be regarded as belonging to another genus. Its branching root, and cylindrical frond are very obvious distinctions, but they are not the only ones. When we come to examine its receptacles more closely, we find, that not merely are they (so to speak) *monœcious*, each receptacle containing the two kinds of conceptacles, while in *Fucus* they are *diœcious* ; but, their cellular structure is widely different, those of the present individuals agreeing much more nearly with the receptacles of *Halidrys*, than of *Fucus proper*. And it is next to *Halidrys* that Kützing has placed it in his arrangement ; and in my opinion, very properly.

There is also a striking affinity between the present genus and *Xiphophora*, Mont., and a nearer analogy, as it appears to me, than with *Himanthalia*, with which the learned founder of the former has ably contrasted it. In *Xiphophora* as in *Pycnophycus*, we have the terminal segments of a dichotomous frond converted into receptacles, which receptacles are in both cases monœcious ; and the most striking difference between the genera is, that in *Pycnophycus* there is an obvious line of demarcation between the frond and the receptacle, while in *Xiphophora* the receptacles are confluent with the upper branches. Possibly *Fucus confluens*, Br., may have a similar structure in essential points.

This plant has a wide range, being found at the Cape of Good Hope, as well as on the shores of southern Europe and of North Africa. In the British Islands, it is much more common in Ireland than in England, being abundant along our western coasts, at least as far north as Galway. Whereabouts in “ the north of Ireland ” Dr. Scott met with it, we are not told, but no one has found it recently on the shores of Ulster.

Fig. 1. PYCNOPHYCUS TUBERCULATUS :—*of the natural size*. 2. A spore. 3. Cross section of a segment of a receptacle, showing a conceptacle cut open, containing parietal spores.



PLATE CCIV.

FUCUS VESICULOSUS, *Linn.*

GEN. CHAR. *Frond* linear, either flat, compressed or cylindrical, dichotomous (rarely pinnated), coriaceous. *Air-vessels* when present, innate, simple. *Receptacles* either terminal or lateral, filled with mucus traversed by a net-work of jointed fibres, pierced by numerous pores which communicate with immersed, spherical *conceptacles*, containing parietal *spores* or *antheridia*, or both. FUCUS (*L.*),—*φυκος*, a seaweed.

FUCUS *vesiculosus*; frond flat, coriaceous, thick, linear, dichotomous, quite entire at the margin, mid-ribbed; air-vessels globose or elliptical, mostly in pairs (often absent); receptacles turgid, elliptical, ovate, or lanceolate, terminal.

FUCUS *vesiculosus*, *Linn. Sp. Pl.* p. 1626. *Linn. Fl. Lap.* p. 366. *Huds. Fl. Ang.* p. 576. *Lightf. Fl. Scot.* p. 904. *Stack. Ner. Brit.* p. 3. t. 2. and p. 12. t. 6. *Esper. Ic.* p. 35. t. 12. 13. and p. 160. t. 83. 84. *Velley*, t. 1. *With. Bot.* vol. iv. p. 84. *Gunn. Fl. Norv.* vol. i. p. 48. *Roth, Fl. Germ.* vol. iii. p. 442. *Turn. Syn.* p. 117. *Turn. Hist.* t. 88. *Lamour. Ess.* p. 18. *E. Bot.* t. 1066. *Lyngb. Hyd. Dan.* p. 3. t. 1. *Ag. Sp. Alg.* vol. i. p. 87. *Ag. Syst.* p. 275. *Grev. Crypt. Fl.* t. 319. *Grev. Alg. Brit.* p. 12. t. 2. *Hook. Br. Fl.* vol. ii. p. 267. *Wyatt, Alg. Danm.* no. 152. *Harv. in Mack. Fl. Hib.* part 3. p. 168. *Harv. Man.* p. 20. *Kütz. Phyc. Gen.* p. 351. t. 33, 34, 35, 36. *Endl. 3rd. Suppl.* p. 29. *Mont. Fl. Canar. Cell.* p. 139. *Mont. Fl. Algier.* p. 21. *Harv. in Bot. Beechey*, p. 163 and 406.

FUCUS *divaricatus*, *Linn. Sp. Pl.* p. 1627. *Lightf. Fl. Scot.* p. 909. *Esp. Ic.* t. 11.

FUCUS *inflatus*, *Linn. Sp. Pl.* p. 1627. *Lightf. Fl. Scot.* p. 910.

FUCUS *spiralis*, *Linn. Sp. Pl.* p. 1627. *Stack. Ner. Brit.* t. 5. *E. Bot.* t. 1685. *Fl. Dan.* t. 286. *Huds. Fl. Ang.* p. 577. *Lightf. Fl. Scot.* p. 911.

FUCUS *volubilis*, *Huds. Fl. Ang.* p. 577.

FUCUS *Sherardi*, *Stack. Ner. Brit.* p. 72. t. 13. *J. Ag. Alg. Medit.* p. 46.

FUCUS *linearis*, *Huds. Fl. Ang.* p. 578.

FUCUS *distichus*, *Lightf. Fl. Scot.* p. 912. (not of *Linn.*)

β. *subcostatus*; very small, densely tufted, with an indistinct mid-rib, and destitute of vesicles.

FUCUS *balticus*, *Ag. Sv. Bot.* t. 516. *Grev. Crypt. Fl.* t. 181.

HAB. On rocks and stones left exposed at low water; also on artificial piers and quays in æstuaries, extending up rivers as long as the water remains sensibly brackish. Perennial. Summer and winter. Very abundant on the British coasts. β. in salt marshes, occasionally flooded. Near Dunstaffnich Castle and Isle of Kerera, *Mr. Maughan*. Appin, *Capt. Carmichael*. Arran, *Sir W. J. Hooker*. Bute, *Dr. Greville*. Baldoyle and Roundstone Bay, (bearing fructifications), *Mr. M'Calla*.

GEOGR. DISTR. Atlantic shores of Europe and North America. Mediterranean Sea. Baltic. The Icy Sea. White Sea. Iceland. Greenland. Nova Zembla. Spitsbergen. California. Sitcha and Sachalin. Siberia at Ochotsk and Kamtskatka. Canary Islands. South Brazil (?). Cape of Good Hope (?), *Ecklon*.

DESCR. *Root*, an expanded, conical disc. *Fronde*s from two inches to two or three feet in length, and from a line to nearly an inch in breadth, flat, furnished with a strong, compressed, percurrent mid-rib, many times dichotomous, sometimes spirally twisted; the margin very entire. *Air-vessels* generally in pairs, one at each side of the mid-rib, spherical or oval, their size varying with the breadth of the frond, formed at uncertain intervals along the segments. *Receptacles* terminal, turgid, and full of lax mucus, variable in form, elliptical, ovate, or linear-lanceolate, sometimes forked, diœcious; those producing spores, of a greenish-olive colour; those with antheridia, a more or less bright orange yellow. *Substance* thickish and very tough. *Colour*, a dark olive, paler in the younger parts.

The commonest and one of the most widely diffused species of the restricted genus *Fucus*. It abounds along the shores of the Northern Atlantic, extending even to the tropics, and is said to have been found in the Southern portion of that Ocean, but the Southern localities want confirmation. In the Pacific, it has been collected on the N. West coast of America.

As may be judged by the numerous synonyms, this is rather a variable plant, but the variations may be summed up in a few words. The first and most obvious is in size; some specimens, fully grown and in fruit, being not an inch in length, while others extend to several feet. The dwarfish individuals, constituting our var. β , grow in brackish water and in muddy places. Other varieties are destitute of air-vessels; or have the air-vessels of a lengthened figure: and others vary in the shape of the fructification, the receptacle being sometimes globose, sometimes ellipsoidal, and sometimes spindle-shaped. Lastly, the frond is frequently spirally twisted. On characters such as these, the *eight* book-species, quoted as synonyms, have been constituted.

Fucus vesiculosus is largely used in the manufacture of kelp; and also yields *mannite* in considerable quantity. In the north of Europe, when the vegetation of the land ceases, or is covered with snow, it furnishes an abundant winter fodder for cattle, which regularly visit the shores, at the retreat of the tide, in search of it. Various are the uses to which the Icelanders and Greenlanders apply it, as Linnæus and others inform us.

Fig. 1. *FUCUS VESICULOSUS*; a branch. 2. A pair of lanceolate receptacles:—*both of the natural size*. 3. Section of a spore-bearing receptacle. 4. *Spores* and paraphyses from the same:—*both magnified*.



PLATE CCLXXI.

FUCUS CERANOIDES, *Linn.*

GEN. CHAR. *Fron*d linear, either flat, compressed, or cylindrical, dichotomous (rarely pinnated), coriaceous. *Air-vessels*, when present, innate, simple. *Receptacles* either terminal or lateral, filled with mucus, traversed by a net-work of jointed fibres, pierced by numerous pores, which communicate with immersed, spherical *conceptacles*, containing parietal *spores*, or *antheridia*, or both. FUCUS (*L.*),—from *φυκος*, a sea-weed.

FUCUS *ceranoides*; frond plane, coriaceo-membranaceous, linear, subdichotomous, entire at the margin, midribbed, without vesicles; lateral branches narrower than the frond, repeatedly forked, level-topped, bearing fruit in their apices; receptacles spindle-shaped or bifid, acute.

FUCUS *ceranoides*, *Linn. Sp. Pl.* p. 1626. *Fl. Lapp.* p. 366. *Stack. Ner. Brit.* p. 71. t. 13. *Good. and Woodw. Linn. Trans.* vol. iii. p. 149. *Turn. Syn. Fuc.* vol. i. p. 136. *Turn. Hist.* t. 89. *Engl. Bot.* t. 2115. *Lyngb. Hyd. Dan.* p. 5. *Ag. Sp. Alg.* vol. i. p. 93. *Ag. Syst.* p. 277. *Grev. Alg. Brit.* p. 14. *Hook. Br. Fl.* vol. ii. p. 267. *Harv. in Mack. Fl. Hib.* part 3. p. 168. *Harv. Man.* ed. 2. p. 19. *Wyatt, Alg. Danm.* no. 154. *J. Ag. Gen. et Sp. Alg.* vol. i. p. 209. *Kütz. Phyc. Un.* p. 352. *Sp. Alg.* p. 590.

FUCUS *distichus*, *Esper, Ic. Fuc.* vol. ii. p. 62. t. 139. (*excl. syn.*)

HAB. On rocks and stones between tide-marks; seldom, except in places where fresh-water streams enter the sea; often in land-locked bays, and estuaries. Perennial. Spring and summer. Many places from Orkney to Cornwall.

GEOGR. DISTR. Atlantic shores of Europe, most frequent in the north. East coast of North America.

DESCR. *Root* a conical disc. *Fron*d from one to two feet in length, much divided in a manner between pinnate and dichotomous, the original branching being dichotomous, and becoming more or less pinnated by the growth of lateral branches; consisting of a midribbed, linear, coriaceous, but thin, membrane, perfectly entire at the edges and destitute of vesicles. The main branches are from a quarter of an inch to half an inch or more in breadth, and always about twice as broad as the lateral branches: they are distantly and pretty regularly forked, with patent, obtuse or emarginate apices. The lateral branches are alternate, or sometimes secund, springing from the sides of the main division; they are narrow, closely and repeatedly forked, level-topped, and as it were corymbose. *Receptacles* small, terminating the lateral branches, fusiform or doubly fusiform and forked, swollen, gelatinous within, and acute or acuminate. *Substance* much thinner and more transparent than in *F. vesiculosus*, but nevertheless coriaceous. *Colour* a greenish or brownish olive.

This species, in many respects, resembles *F. vesiculosus*, with some varieties of which it has been occasionally confounded; but it has many characters by which it may at all times be known, independently of the absence of vesicles,—which character is too variable to be depended on, for in many forms of *F. vesiculosus* vesicles are wanting. *F. ceranoides* may be readily known by its much thinner and more transparent substance, and by containing a less quantity of saline matters; so that it dries much more rapidly when removed from the water, and requires far less steeping in fresh water when specimens are prepared for the Herbarium.

The usual habitat of this species is in places where a good deal of fresh water mixes with the sea; but it is by no means confined to such places. I have gathered specimens on exposed parts of the shore, where no fresh water flowed in. In the Loch of Stennis, Orkney, where the water is but faintly brackish, a very narrow variety is abundant. The greater the amount of saltness in the water the broader is the frond, but in no case is the substance so thick and leathery as in *F. vesiculosus*. The lateral fructification is very characteristic of this species, but is not essential, for there is a variety of *F. vesiculosus* figured by Dr. Greville having also lateral fruit.

Fig. 1. *FUCUS CERANOIDES*:—*the natural size*. 2. Section of one of the *conceptacles*, from the receptacle, containing spores and paranemata:—*magnified*.



PLATE XLVII.

FUCUS SERRATUS, *Linn.*

GEN. CHAR. *Frond* linear, either flat, compressed, or cylindrical, dichotomous (rarely pinnated), coriaceous. *Air-vessels*, when present, innate, simple. *Receptacles* either terminal, or lateral, filled with mucus traversed by a network of jointed fibres, pierced by numerous pores, which communicate with immersed spherical *conceptacles*, containing parietal *spores*, or *antheridia*, or both. FUCUS (*L*), φῦκος, a seaweed.

FUCUS *serratus*; frond plane, dichotomous, mid-ribbed, serrated, without air-vessels; receptacles flat, terminating the branches, serrated.

FUCUS *serratus*, *Linn. Sp. Pl.* p. 1626. *Fl. Lap.* p. 365. *Fl. Suec.* p. 430. *Huds. Fl. Ang.* p. 576. *Lightf. Fl. Scot.* vol. ii. p. 902. *Stack. Ner. Brit.* p. 2. t. 1. *Turn. Syn.* vol. i. p. 110. *Hist.* t. 90. *E. Bot.* t. 1221. *Lyngb. Hyd.* p. 5. t. 1. *Ag. Sp. Alg.* vol. i. p. 95. *Syst.* p. 278. *Hook Fl. Scot.* part 2. p. 95. *Grev. Fl. Edin.* p. 284. *Alg. Brit.* p. 15. *Hook. Br. Fl.* vol. ii. p. 267. *Harv. in Mack. Fl. Hib.* part 3. p. 169. *Wyatt, Alg. Danm.* no. 2. *Endl. 3. Suppl.* p. 29. *Kütz. Phyc. Gen.* p. 352.

HAB. On rocky sea shores, clothing the rocks at half-tide level. Perennial. Winter and Spring. Very common.

GEOGR. DISTR. Atlantic coasts of Europe from Norway to Spain. Baltic Sea. Greenland, *Lyngb.* Coast of Piedmont, *Allioni* (doubtful).

DESCR. *Root* a hard, conical disc. *Frond* from two to six feet long, and from half an inch to two inches in breadth, linear, traversed by a strong, thick mid-rib, regularly dichotomous, the margin sharply serrated, or occasionally laciniated. *Mid-rib* thickened at the forking. *Vesicles* none. *Receptacles* flat, terminating the branches, of which they are merely prolongations, slightly altered in structure, and containing numerous immersed *conceptacles* communicating with external pores. These *conceptacles* are spherical, hollow, and seem to be formed by an inflexion of the periphery of the frond. In some individuals they produce from all parts of their inner surface, numerous obovate spores, which finally separate into eight distinct sporules, and are surrounded by filamentous processes. In other individuals the place of the spores is occupied by tufts of much-branched, jointed filaments, which produce an abundance of elliptical cellules, filled with numerous, bright-orange, vivaceous corpuscles or *zoospores*, which eventually issue from their cases and swim about, with a rapid motion, resembling the voluntary movement of animalcules. These *cellules* are called *antheridia*, and their contained *zoospores* supposed to fulfil the office of pollen. They are never found on the same plant as the spores, the species being strictly diœcious.

Fucus serratus abounds on all the Atlantic shores of Europe, and probably extends to the eastern shores of America, but is not found, according to J. Agardh, in the Mediterranean Sea, although

mentioned by Allioni. It does not appear to extend to the Pacific, nor to be found in the Southern Ocean.

It presents some varieties, chiefly distinguished by the greater or less breadth of the frond, and the depth of the serratures. I have chosen one of the most common states for illustration. In the variety *integerrimus* of Turner, the marginal serratures are very shallow, and sometimes obsolete, but always sufficiently marked to prevent the species being mistaken. In his variety *latifolius*, the upper branches are very much wider than the lower, sometimes more than two inches broad, and remarkably rounded, not unlike the webbed feet of some waterfowl; and in Greville's variety *laciniatus*, the serratures are very deeply cut, "and cleft or lacinate."

Messrs. Decaisne and Thuret, who first discovered the zoospores above described, of which they have given a most interesting account in the 'Annales des Sciences Naturelles', divide the Agardhian genus *Fucus* into several genera, of which *F. serratus*, *F. nodosus*, *F. canaliculatus*, and *F. tuberculatus* respectively are the types, and which they distinguish chiefly by the spores containing eight, four, two, or one sporules; a minute character which accompanies some differences in natural habit, and might be resorted to were the genus *Fucus* of great extent. But in so small a genus it appears scarcely necessary to burden the science with so many new names.

To observe the *zoospores* in motion, fresh specimens, collected in winter or early spring, having orange-coloured receptacles, should be removed from the water, and left to dry partially. As the surface dries, there will exude from the pores of the receptacle, drops of a thick, orange-coloured liquid, which, on being placed under a microscope and moistened with salt water, will be found to be composed of innumerable *antheridia*, from which will issue troops of zoospores, which, the moment of their liberation, commence those strange animal motions which have so much puzzled philosophers to reconcile with vegetable life.

Fig. 1. *FUCUS SERRATUS* :—*natural size*. 2. Transverse section of the *receptacle*, showing two *conceptacles*. 3. Spores from the same. 4. A cluster of *antheridia*. 5. An *antheridium* containing *zoospores*, some of which have escaped :—*all magnified*.



PLATE CLVIII.

FUCUS NODOSUS, *Linn.*

GEN. CHAR. *Fronde* linear, either flat, compressed, or cylindrical, dichotomous (rarely pinnated), coriaceous. *Air-vessels*, when present, innate, simple. *Receptacles* either terminal or lateral, filled with mucus traversed by a net-work of jointed fibres, pierced by numerous pores, which communicate with immersed, spherical *conceptacles*, containing parietal *spores*, or *antheridia*, or both. FUCUS (*L.*),—from *φυκος*, a *Sea-weed*.

FUCUS *nodosus*; frond compressed, without distinct rib, leathery, subdichotomous; branches strap-shaped, somewhat pinnated, attenuate at base, remotely toothed, here and there swelling into oblong air-vessels; receptacles lateral, ovate, stalked, springing from the axils of the marginal teeth.

FUCUS *nodosus*, *Linn. Sp. Pl.* p. 1628. *Fl. Suec.* p. 431. *Fl. Lapp.* p. 366. *Lightf. Fl. Scot.* vol. ii. p. 918. *Huds. Fl. Ang.* p. 584. *With.* vol. iv. p. 84. *Stack. Ner. Brit.* p. 35. t. 10. *Fl. Dan.* t. 146. *E. Bot.* t. 570. *Esper*, p. 25. t. 7. and p. 118. t. 60. *Gm. Hist.* t. 1. B. f. 1. *Turn. Syn.* p. 252. *Turn. Hist.* t. 91. *Lamour. Ess.* p. 19. *Ag. Sp. Alg.* vol. i. p. 85. *Ag. Syst.* p. 275. *Hook. Fl. Scot.* part. 2. p. 94. *Grev. Fl. Edin.* p. 284. *Spr. Syst. Veg.* vol. iv. p. 316. *Grev. Alg. Brit.* p. 16. *Hook. Br. Fl.* vol. ii. p. 268. *Wyatt, Alg. Danm.* no. 154. *Harv. in Mack. Fl. Hib.* part 3. p. 169. *Harv. Man.* p. 21. *Endl. 3rd Suppl.* p. 29.

HALIDRYS *nodosa*, *Lyngb. Hyd. Dan.* p. 37. t. 8.

PHYSOCAULON *nodosum*, *Kütz. Phyc. Gen.* p. 352.

OZOTHALLIA *vulgaris*, *Dne. in An. Sc. Nat.* 1845. p. 13.

HAB. Growing on sub-marine rocks and large boulder stones, from ordinary high-water mark to half-tide level. Perennial. Winter and Spring. Very common.

GEOGR. DISTR. Atlantic shores of Europe and North America.

DESCR. *Root* a hard, conical disc, one or two inches in diameter. *Fronde*s tufted, from two to four or six feet in length, from a quarter to half an inch or more in width, compressed, two-edged, thickened into an obscure rib in the middle, especially in older parts, linear, once or twice forked at considerable intervals, remotely toothed at the margin. From the axils of the teeth spring lateral, distichous branches similar to the main frond, toothed and again once or twice pinnated with smaller branches, which are either simple and lanceolate or cuneate and forked; or furnished, in place of branchlets, with solitary or tufted receptacles. All the divisions of the frond are very much attenuated at base, and more or less acute at the apex. *Vesicles* one to two inches long, oval-oblong, formed at intervals in the principal stem and branches; rarely absent. *Receptacles* springing from the axils of the marginal teeth, ovate, raised on slender stalks, from half an inch to upwards of an inch in length, bright yellow when ripe, two or more often issuing

from the same point. These contain, in some individuals, *antheridia*, affixed to branching threads; in others, globose spores, which at length separate into four sporules. *Substance* exceedingly tough and leathery. *Colour* a dull, olive-green; which becomes black in drying.

This is the largest of the British species of the restricted genus *Fucus*, and by far the toughest and most rigid. Its substance is thicker and denser than that of any of the others, and its frequently pinnated habit, and remarkably large vesicles, added to the ribless frond, afford strong marks of distinction. When in fructification, the great abundance of the clear yellow receptacles contrasts agreeably with the colour of the other parts of the frond. Like most other submersed plants this varies in luxuriance according to the depth at which it grows: specimens near high-water mark being short and bushy, often exceedingly crowded in branches, and thickly covered with fruit; while those produced near ordinary low-water are drawn out to a great length, with more distant branches. The older authors founded varieties, which are scarcely worth noticing, on these differences.

Fucus nodosus is almost always more or less infested with *Polysiphonia fastigiata*, which forms globose tufts of a rich brown colour on various parts of its fronds. This parasite is not confined to the present species, however, but may often be seen on old stumps of *F. vesiculosus*, to which it generally attaches itself near the root only.

F. nodosus is one of those largely used in the manufacture of Kelp, which it yields in considerable quantities. Oystermen sometimes employ it to cover their oysters, though *F. serratus* is more generally employed for that purpose. In Scotland this plant is called *Sea-Whistles*; and boys make whistles of the larger air-vessels, according to Lightfoot, by cutting them across near one end.

Fig. 1. *FUCUS NODOSUS*; portion of a frond—*of the natural size*. 2. Segment of a receptacle:—*slightly magnified*. 3. A spore:—*highly magnified*.

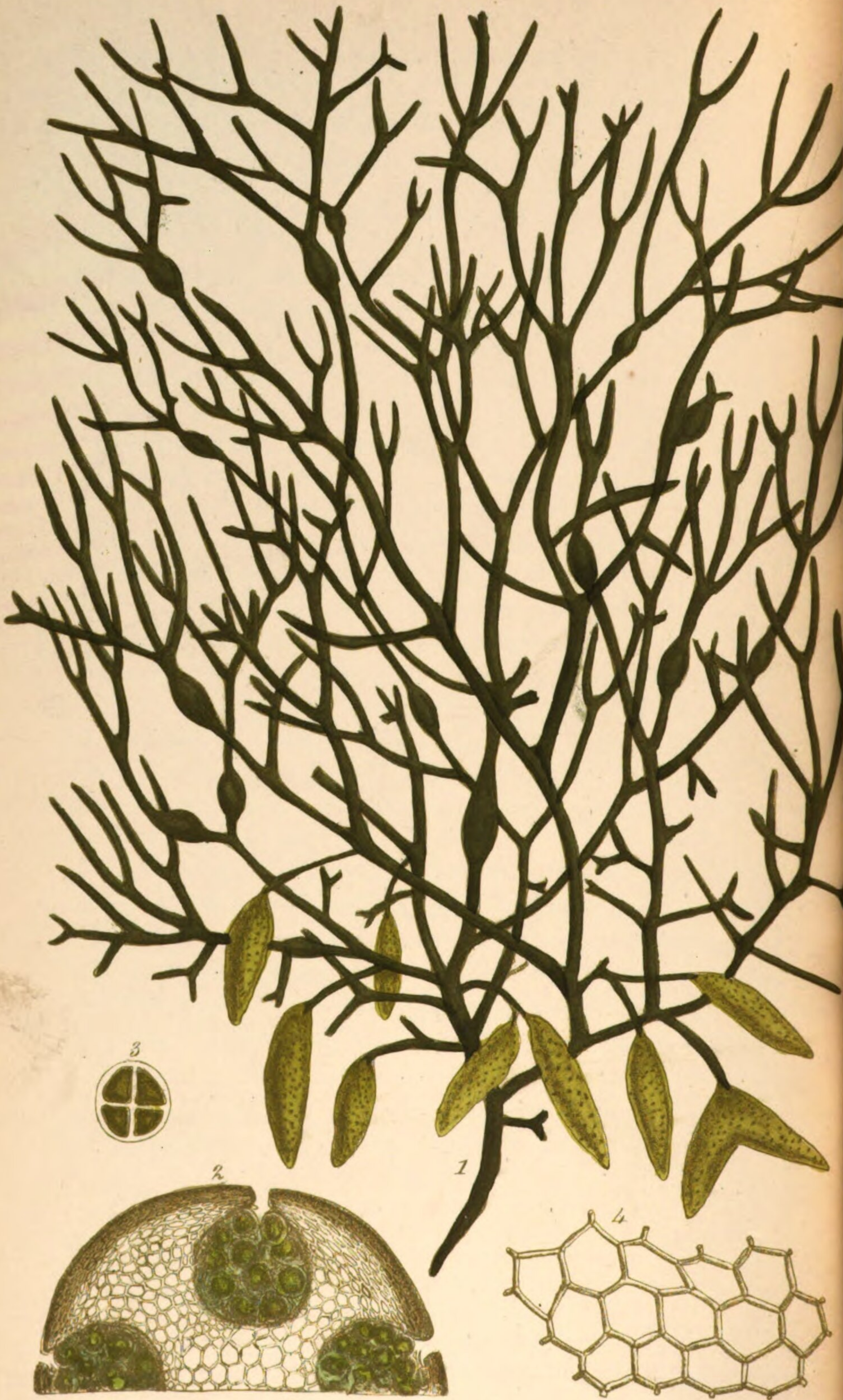


PLATE LII.

FUCUS MACKAIL, *Turn.*

GEN. CHAR. *Frond* linear, either flat, compressed, or cylindrical, dichotomous (rarely pinnated), coriaceous. *Air vessels*, when present, innate, simple. *Receptacles* either terminal, or lateral, filled with mucus traversed by a net-work of jointed fibres, pierced by numerous pores, which communicate with immersed spherical *conceptacles*, containing parietal *spores*, or *antheridia*, or both. FUCUS (*L*), *φῦκος*, a seaweed.

FUCUS *Mackaili*; frond cylindrical or subcompressed, slender, much branched; branches dichotomous; air vessels elliptical, solitary; receptacles lateral, lanceolate, ovate, or forked, stalked, pendulous, scattered, near the base of the branches.

FUCUS *Mackaili*, *Turn. Hist.* t. 52. *Sm. E. Bot.* t. 1927. *Lam. Ess.* p. 20. *Ag. Sp. Alg.* vol. i. p. 87. *Hook. Fl. Scot.* part 2. p. 95. *Grev. Alg. Br.* p. 17. *Hook. Br. Fl.* vol. ii. p. 268. *Harv. in Mack. Fl. Hib.* part 3. p. 169. *Harv. Man.* p. 21. *Grev. in Phyc.* vol. i. p. 465.

FUCUS *nodosus*, γ. *Mackaili*, *Ag. Syst.* p. 275.

PHYSOCAULON *Mackaili*, *Kütz. Phyc. Gen.* p. 352.

HAB. Muddy sea shores, usually in land-locked bays, and among boulders. Perennial. April and May. Birterbui Bay, Cunnemara, *Mr. J. T. Mackay*. (1805). Loch Seaforth, *Lord Seaforth*. Arasaig, *Mr. Borrer*. Loch Coul and Kyle Scough, Sutherland, *Messrs. Borrer and Hooker*. East coast of Skye, and head of Loch Duich *Messrs. Hooker and Greville*.

GEOGR. DISTR. North of Europe. Baltic sea, *Areschoug*.

DESCR. *Fronds* growing in globular tufts the size of a human head or larger, many fronds radiating from a subcentral point, but without obvious root or attachment. *Fronds* 6-12 inches long, from half a line to two lines in diameter, cylindrical or subcompressed, cartilagineo-coriaceous, rather brittle, ribless, with a short, simple or forked main stem, from which issue, without much regularity, numerous long, repeatedly dichotomous or occasionally trichotomous branches, which gradually taper to the apices, where they are often less than a quarter of a line in diameter, and are beset throughout their length with more or less frequent, lateral, simple, or forked, patent ramuli. *Axils* patent, rounded; apices blunt. *Vesicles* from a quarter to half an inch in length, two lines wide, few, occurring generally below the forkings of the longer branches; sometimes wanting. *Receptacles* lateral, borne by slender peduncles issuing irregularly from the sides of the branches near their base, pendulous, lanceolate, or bilobed, or somewhat ovate, yellow, containing numerous spherical *conceptacles*, full of roundish spores, each of which separates at maturity into four sporules. *Colour* a dull olive. *Substance* when dry somewhat horny and translucent.

Fucus Mackaii was discovered in the year 1805, on the western coast of Ireland, by Mr. James Townsend Mackay, author of the *Flora Hibernica*, in honour of whom the species has been named by Mr. Dawson Turner in his great work, the '*Historia Fucorum*'. For a long time the fructification remained undiscovered, and, consequently, a doubt rested on the validity of the species, the resemblance, in many respects, to a dwarfed variety of *Fucus nodosus* suggesting a probability that it was only a form of that plant. No doubt the connection between these plants is very strong, yet the difference in ramification is so great, and the constancy of character observed in *Fucus Mackaii* in many widely distant localities in which it has been abundantly found, is so remarkable, that added now to distinctions, afforded by the position of the fruit, its characters are better established. Still, its habitat is anomalous, and it may be urged that the peculiar characters originate in this habitat. The *Fuci* in general are attached by scutate roots to rocks and stones; *Fucus Mackaii* invariably lies unattached, resting in its place, by its own weight, on mud, gravel, or among loose boulders. In such situations it flourishes from year to year, and fruits abundantly.

The fruit was first observed by Dr. Greville in the autumn of 1842, in the collection of Mrs. Captain Maynard at Stanraer, to whom it was communicated by Dr. Lindsay from the Isle of Skye. More recently, in the Spring of 1846, Mr. Mc' Calla found an abundance of specimens in fructification, which is, probably, produced every year, but from the early season at which it is formed, when few botanists have an opportunity of seeing the plant, unless resident near its place of growth, the fruit has hitherto escaped detection. From a fine specimen, communicated to me by Mr. Mc' Calla, in a fresh state, my figure has been taken, and I have since (in June) had the pleasure of gathering fine fruiting specimens in the Sound of Skye. The pendulous receptacles, produced at the bases of the main branches, and the contrast between their clear greenish yellow, and the olivaceous colour of the frond, have a very pretty effect.

Fig. 1. *FUCUS MACKAII*:—*natural size*. 2. Transverse segment of a receptacle.
3. A spore. 4. portion of the net-work from the centre of the receptacle:
—*all highly magnified*.



PLATE CCXXIX.

FUCUS CANALICULATUS, *Linn.*

GEN. CHAR. *Fronde* linear, either flat, compressed, or cylindrical, dichotomous (rarely pinnated), coriaceous. Air-vessels, when present, innate, simple. *Receptacles* either terminal or lateral, filled with mucus traversed by a net-work of jointed fibres, pierced by numerous pores, which communicate with immersed, spherical conceptacles, containing parietal *spores* or *antheridia*, or both. FUCUS (*L.*),—from *φυκος*, a sea-weed.

FUCUS *canaliculatus*; frond linear, narrow, channelled on one side, without mid-rib or air-vessels, dichotomous; receptacles terminal, bipartite.

FUCUS *canaliculatus*, *Linn. Syst. Nat.* vol. ii. p. 716. *Fl. Dan.* t. 214. *Gm. Hist.* p. 73. t. 1. A. f. 2. *Lightf. Fl. Scot.* p. 917. *Velley*, t. 1. *With.* vol. iv. p. 99. *Turn. Syn.* p. 242. *Turn. Hist.* t. 3. *Sm. E. Bot.* t. 823. *Lamour. Ess.* p. 20. *Lyngb. Hyd. Dan.* p. 6. t. 1. *Ag. Sp. Alg.* vol. i. p. 96. *Ag. Syst.* p. 279. *Hook. Fl. Scot.* part 2. p. 96. *Grev. Fl. Edin.* p. 284. *Grev. Alg. Brit.* p. 18. *Hook. Br. Fl.* vol. ii. p. 268. *Harv. in Mack. Fl. Hib.* part 3, p. 169. *Harv. Man.* p. 21. *Wyatt, Alg. Danm.* no. 102. *Kütz. Phyc. Gen.* p. 352.

FUCUS *excisus*, *Linn. Sp. Pl.* p. 1627. *Mant.* p. 508. *Fl. Lapp.* p. 366. *Gunn. Fl. Norv.* vol. i. p. 96.

PELVETIA *canaliculata*, *Dne. An. Sc. Nat.* 1845, p. 12.

FUCODIUM *canaliculatum*, *J. Ag. Sp. Alg.* vol. i. p. 204.

HAB. On rocky sea-shores, between high-water mark and half-tide level. Perennial. Summer and autumn.

GEOGR. DISTR. Atlantic shores of Europe and North America.

DESCR. *Root*, a conical expansion, half an inch or more in diameter. *Fronde* densely tufted, from two to six inches or more in height, one to two or three lines in breadth, nearly of equal breadth throughout, deeply channelled on one side, and rounded on the other, many times dichotomous in a tolerably regular manner; the apices generally bifid. *Receptacles* terminating the branches, narrow-cuneate, either deeply cloven or bipartite, swollen, tubercular, containing numerous immersed conceptacles. *Spores* elliptical, at length separating, by a transverse division, into two sporules. *Substance* very tough and leathery. *Structure* dense. *Colour*, a clear olive when young, becoming brownish or foxy in old age, the receptacles at length greenish-yellow.

This species begins to vegetate on the very edge of high-water mark, often in places where it is only wet by the spray. In such situations it attains a dwarfish size, seldom reaching more than an inch or two in height, but the specimens sometimes arrive at

maturity and produce fruit. Between this, its extreme limit, and the level of half-tide, the main crop is developed, the fronds attaining a greater size with the increasing depth of water; but beyond half-tide we rarely, if ever, meet with *Fucus canaliculatus*. It evidently requires by its organization, exposure to the atmosphere for a considerable period each day. Unlike most of its congeners it rarely covers wide spaces of rock, but more commonly grows in scattered tufts in places where, on the recess of the tide, the water rapidly drains off. It thus shows, in all its habits, a peculiar adaptation for drought, and its tough and close texture admirably fit it for long resisting the drying effects of sun and air. Still, it often becomes quite dry and crisp in a hot summer's day, and yet recovers life and flexibility on the return of the tide. None of our marine plants are less variable in character. Its channelled stem is always recognisable, and its ramification, if the frond be not injured, is invariably dichotomous. In cases of accidental injury, however, the wounded parts become proliferous and throw out numerous branches without order, converting such specimens into dense bushes.

Fig. 1. *FUCUS CANALICULATUS*:—*of the natural size*. 2. Part of a receptacle, with its immersed conceptacles. 3. Section of portion of the same, one of the conceptacles cut through. 4. A spore. 5. Some of the filaments which accompany the spores:—*all more or less highly magnified*.



PLATE LXXVIII.

HIMANTHALIA LOREA, *Lyngb.*

GEN. CHAR. *Frond* top-shaped. *Receptacles* very long, strap-shaped, repeatedly forked, springing from the centre of the frond, filled with mucus traversed by jointed fibres, and pierced by numerous pores, which communicate with immersed spherical *conceptacles*, containing either parietal *spores*, or (in distinct individuals) *antheridia*. HIMANTHALIA (*Lyngb.*)—from *ἴμας*, a *strap*, and *θάλος*, a *branch* (or *ἄλς*, the *sea*.)

HIMANTHALIA *loreæ*; frond top-shaped, at length cup-shaped, stalked; receptacles repeatedly dichotomous, tapering more or less at the apex.

HIMANTHALIA *loreæ*, *Lyngb. Hyd. Dan.* p. 36. t. 8. *Grev. Fl. Edin.* p. 285. *Gaill. in Dict. Sc. Nat.* vol. 53. p. 357. *Grev. Alg. Brit.* p. 20. t. 3. *Hook. Br. Fl.* vol. ii. p. 269. *Wyatt, Alg. Danm.* no. 3. *Harv. in Mack. Fl. Hib.* part 3. p. 170. *Harv. Man.* p. 22. *Kütz. Phyc. Gen.* p. 351. *Endl. 3rd Suppl.* p. 29.

FUCUS *loreus*, *Linn. Syst. Nat.* vol. ii. p. 716. *Gm.* vol. ii. p. 1382. *Huds. Fl. Ang.* p. 583. *Lightf. Fl. Scot.* p. 920. *Fl. Dan.* t. 710. *With. Ar.* vol. iv. p. 96. *Stack. Ner. Brit.* p. 37. t. 10. *E. Bot.* t. 569. *Turn. Syn. Fuc.* vol. ii. p. 246. *Hist.* t. 196. *Lamour. Ess.* p. 19. *Ag. Sp. Alg.* vol. i. p. 98. *Ag. Syst.* p. 280. *Spreng. Syst. Veg.* vol. iv. p. 316.

FUCUS *elongatus*, *Linn. Sp. Pl.* vol. ii. p. 1627 (*excl. syn. Moris*). *Syst.* vol. ii. p. 716. *Gm.* vol. ii. p. 1381. *Gm. Hist. Fuc.* p. 103. (*excl. syn. Huds.*).

FUCUS *longo angusto crassoque folio*, *Raii. Syn.* p. 43. n. 11.

FUCUS *fungis affinis*, *Raii. l. c.* p. 43. n. 15.

HAB. On rocky sea shores, near low water mark. Annual? Winter and spring. Common.

GEOGR. DISTR. Atlantic shores of Europe from Iceland (*Mohr.*) to Portugal (*Brotero*). Eastern coast of North America.

DESCR. *Root* scutate. *Fronds* tufted, when young narrow obconical, gradually becoming wider above, and finally being top-shaped, depressed in the centre, with an expanded circular rim, thus becoming slightly cup-shaped, or pezizæform. *Receptacles* springing from the centre (i.e. the apex) of the cup-like frond, varying in length from two to ten, or according to some authors, to twenty feet; from a quarter to half an inch in width, compressed, linear, repeatedly dichotomous, tapering at the apices into more or less acute points. Internally these receptacles are filled with a watery gelatine traversed by confervoid filaments. Their outer coat is firmly cellular, and pierced by numerous pores beneath each of which is formed a small spherical chamber or conceptacle. The fructification is dioecious. In some individuals the conceptacles contain tufts of *antheridia*, attached to branching filaments, similar to those of *Fucus*. In others they contain, immersed

among confervoid filaments, three or four large, roundish, olive-coloured spores, which divide internally at maturity into four sporules. *Colour*, a dark olive, occasionally pale yellowish. *Substance* coriaceous.

This well-known plant, which, with some schooling, we have contrived to bring within the narrow compass of our plate, is very common on most of the rocky Atlantic coasts of Europe and North America, but is not found in the Mediterranean.

Authors are at variance as to its duration; Turner and Carmichael asserting that it is a *perennial*; Greville and Mrs. Griffiths that it is *annual*. Certain it is that the plant appears to reach to its full growth within the year, and that vast multitudes of fronds then decay; while their receptacles are detached, and drift ashore in tangled strata. Possibly some survive to a second season, and throw out new receptacles; for I am unwilling to set aside the evidence of so close an observer as the late Captain Carmichael, who declares that he has seen old fronds which had shed their first receptacles, throw out others, which latter frequently spring, according to the same authority, from some ex-centric point of the disc. I have, I must add, repeatedly and in vain sought for instances of this second growth, and am therefore disposed to regard the species as being, under common circumstance, an annual,—granting that it may occasionally be biennial, from the influence of local causes.

The common name is Sea Thongs, of which the lengthy Greek by which it is known to botanists is nearly a literal translation. It is used in the manufacture of Kelp, in which salt it is said to be rich, though inferior in this respect to some of the true *Fuci*.

Fig. 1. HIMANTHALIA LOREA, a small specimen:—*the natural size*. 2. Cross section of the receptacle. 3. Enlarged view of a *conceptacle*:—*in situ*. 4. A spore, containing four sporules, and surrounded by hyaline filaments.



PLATE CXV.

DESMARESTIA *LIGULATA*, *Lamour*.

GEN. CHAR. *Fronde* linear, either filiform, compressed or flat, distichously branched, cellular, traversed by an internal, single-tubed jointed filament; producing, when young, marginal tufts of byssoid, branching fibres. *Fructification* unknown.—DESMARESTIA (*Lamour*.), in honour of *A. G. Desmarest*, a celebrated French naturalist.

DESMARESTIA *ligulata*; frond flat, with an obscure mid-rib, repeatedly pinnate; pinnæ and pinnulæ opposite, linear-lanceolate, tapering towards both extremities.

DESMARESTIA *ligulata*, *Lamour. Ess.* p. 25. *Grev. Alg. Brit.* p. 37. t. 5. *Hook. Br. Fl.* vol. ii. p. 273. *Harv. in Mack. Fl. Hib.* part 3. p. 172. *Harv. Man.* p. 26. *Wyatt, Alg. Danm.* no. 55. *Endl. 3rd Suppl.* p. 28. *Kütz. Phyc. Gen.* p. 343.

DESMIA *ligulata*, *Lyngb. Hyd. Dan.* p. 33. t. 7.

SPOROCHNUS *ligulatus*, *Ag. Sp. Alg.* vol. i. p. 158. *Ag. Syst.* p. 261. *Grev. Fl. Edin.* p. 287. *Spreng. Syst. Veget.* vol. iv. p. 330.

LAMINARIA *ligulata*, *Hook. Fl. Scot.* part 2. p. 99.

FUCUS *ligulatus*, *Lightf. Fl. Scot.* p. 946. t. 29. *Turn. Syn.* p. 99. *Turn. Hist. Fuc.* t. 98. *Sm. E. Bot.* t. 1636.

FUCUS *herbaceus*, *Huds. Fl. Ang.* p. 582.

HAB. On the rocky bottoms of sub-marine tide-pools, near low water mark; and at a greater depth. Annual. Summer. Not uncommon on the shores of the British Islands from Orkney to Cornwall. Jersey.

GEOGR. DISTR. European Atlantic, from the shores of the Fœroe Islands to the coast of France. Cape Horn, *Dr. Hooker*.

DESCR. *Root* a large conical expansion, half an inch broad. *Fronde*s from two to six feet long or more, with a short, cylindrical, cartilaginous stem from half a line to a line in diameter, which soon becomes compressed, and at the distance of an inch or two from the base passes into the flat, linear, undivided frond, which gradually widens to its middle, and from thence is attenuated to the apex: this primary frond is from one to four lines wide, furnished with a more or less evident mid-rib, and closely pinnated, at distances varying from an eighth of an inch to upwards of an inch, with opposite, distichous branches. *Branches* very variable in length, the long and short ones mixed together without order; the smaller ones simple, from half an inch to an inch long, resembling lanceolate leaves; the larger pinnate or bipinnate, all the divisions being of a lanceolate form, but varying much in relative breadth in different specimens, sometimes not one third of a line in breadth, sometimes three or four lines. All the pinnules are margined with minute spine-like teeth, which in young individuals produce tufts of delicate, branching, jointed fibres. *Fructification* unknown. *Sub-*

stance at first cartilaginous, firm and elastic, but soon, on removal from the water, becoming flaccid. *Colour*, when growing, a clear olive brown, soon becoming verdigris green in the air, and when preserved in the herbarium usually a yellowish olive.

A very elegant plant, one of the most beautiful of our olive coloured Algæ, and not uncommon on any of the British shores. It was first described by Lightfoot in his 'Flora Scotica,' where an excellent figure is also given. With a perfect regularity in its branching, and in all the lesser details of its habit, there is so much difference in the relative breadth of the frond, that specimens from different parts of the coast have a very opposite aspect. In some the branches are broader than our larger figure represents, and these approach the narrower forms of the exotic *D. herbacea*, whose broader varieties have branches as wide as the laciniae of a *Laminaria*; in others the frond is so narrow, that, as Mr. Turner well observes, such individuals may, at first sight, be mistaken for luxuriant fronds of *D. viridis*, whose narrower varieties are as delicate as the finest *Confervæ*. One would scarcely expect this close connection by comparing merely typical states of these three species, but by an extensive suite of specimens the approximation may be very clearly shown, but it never arrives at the point where one absolutely passes into the other.

Desmarestia ligulata is widely distributed in the Northern Atlantic, and probably as common on the American as the European side, though we have as yet no evidence of the fact. In the southern hemisphere I am only aware of its having been found at Cape Horn, where Dr. J. D. Hooker dredged, from a considerable depth, specimens in all respects similar to British individuals. This fact is the more interesting because the same locality furnishes another closely analogous, but perfectly distinct species, *D. Rossii*, which, but for the presence of the true *D. ligulata*, one would be inclined to regard as its representative.

Fig. 1. DESMARESTIA LIGULATA, part of a frond. 2. A branch of a narrower individual:—both of the natural size. 3. A cross section of the lower part of the frond:—magnified.



PLATE XLIX.

DESMARESTIA ACULEATA, *Lamour*.

GEN. CHAR. *Frond* linear, either filiform, compressed, or flat, distichously branched, cellular, traversed by an internal, single-tubed, jointed filament; producing, when young, marginal tufts of byssoid, branching fibres. *Fructification* unknown. DESMARESTIA (*Lamour*.)—in honour of A. G. Desmarest, a celebrated French naturalist.

DESMARESTIA *aculeata*; stem short, cylindrical, bearing numerous slender, elongate, flattish, irregularly bi-tri-pinnate branches; pinnæ and pin-nulæ alternate, tapering at the base, filiform, either fringed with opposite tufts of bright green fibres, or margined with erect, awl-shaped, alternate, distichous spines.

DESMARESTIA *aculeata*, *Lam. Ess.* p. 25. *Grev. Alg. Brit.* p. 38. t. 5. f. 2, 3. *Hook. Br. Fl.* vol. ii. p. 273. *Harv. in Mack. Fl. Hib.* part 3. p. 172. *Wyatt, Alg. Danm.* no. 158. *Harv. Man.* p. 26. *Endl. 3rd Suppl.* p. 28. *Kütz. Phyc. Gen.* p. 343. t. 26. f. 1.

DESMIA *aculeata*, *Lyngb. Hyd. Dan.* p. 34. t. 44. B. 1.

SPOROCHNUS *aculeatus*, *Ag. Sp. Alg.* vol. i. p. 151. *Ag. Syst.* p. 259. *Hook. Fl. Scot.* part 2. p. 96. *Grev. Fl. Edin.* p. 287.

FUCUS *aculeatus*, *Linn. Sp. Pl.* p. 1632. *Huds. Fl. Ang.* p. 585. *Light. Fl. Scot.* p. 924. *Fl. Dan.* t. 355. *Stack. Ner. Brit.* p. 24. t. 8. *Turn. Syn.* vol. ii. p. 262. *Turn. Hist.* t. 187.

FUCUS *muscoïdes*, *Linn. Sp. Pl.* p. 1630. *Huds. Fl. Ang.* p. 590.

HAB. On rocks and stones in the sea, near low-water mark, and at a greater depth. Perennial. Common on the shores of the British Islands.

GEOGR. DISTR. Atlantic shores of Europe, from North Cape to Spain. Shores of Piedmont, *Allioni* (but omitted by *J. Agardh* in his *Alg. Medit.*).

DESCR. *Root* a hard disc. *Fronds* 1-3, to 6 feet in length, undivided, or branching from a short distance above the base, preserving throughout a nearly equal breadth of half a line, compressed, more or less angularly flexuous, bearing along their whole length alternate lateral branches, the lower of which are longest, the rest gradually shorter upwards. *Lower branches* repeatedly compound, bearing one, two, or three sets of distichous, alternate, erect or erecto-patent lateral branches; *upper* ones gradually less and less compound, and those near the apex quite simple. Occasionally two branches spring from the same point, at the same side of the stem; and more rarely, two of the lesser branches are found opposite to each other. In an early stage of growth all the branches are clothed, at intervals of about a line, with opposite pencils of finely divided, repeatedly pinnate, byssoid, articulated fibres of a beautiful yellow-green colour, which apparently originate in the jointed thread which runs through the centre of the frond. These fibres soon fall away, leaving the stems and branches naked, and then alternate, subulate spines are developed at intervals of two to four

lines along the margin. Occasionally spines and filaments are to be found at the same time, the former being slender and weak. *Substance* cartilaginous when young; very rigid when old. *Colour*, at first, pale greenish olive, finally, foxy brown.

At different stages of its growth this plant presents such opposite appearances, that a young botanist may readily mistake, for two species, forms which depend entirely on age, and which have deceived even Linnæus himself. When young, the whole frond is of a tender substance, bright green colour, and beautifully fringed with filaments; when old, it is coarse, brown, naked, and thorny. In plants of the second year, such as our figure represents, these characters are often found combined in the same specimen, in which the older parts of the frond are naked and spiny, the younger shoots being green and clothed with pencilled filaments. No fructification has yet been observed on this, or any other, species of *Desmarestia*.

In the Southern Ocean a closely allied species was found at Cockburn Island, lat. $64^{\circ} 13'$ S., by the officers of the 'Erebus' and 'Terror', nearly at the southern limit at which they observed a marine vegetation. It appears to be identical with *D. media*, Ag., a species originally found at Unalascha, in Russian America, and differs from *D. aculeata* in having the branches generally opposite or nearly so. It, indeed, presents characters almost exactly intermediate between *Dichloria viridis* and *D. aculeata*; so much so, that I do not think the genus *Dichloria* can be retained as distinct from *Desmarestia*, notwithstanding the absence of confervoid filaments.

Fig. 1. *DESMARESTIA ACULEATA*; a small plant:—*natural size*. 2. One of the byssoid fibres. 3. Transverse section of the frond. 4. Longitudinal semi-section of the same:—*magnified*.



PLATE CCCXII.

DESMARESTIA VIRIDIS, *Lamour*.

GEN. CHAR. *Fronde* linear, either filiform, compressed, or flat, distichously branched, cellular, traversed by an internal, single-tubed, articulated filament; producing, when young, marginal tufts of byssoid, branching fibres. DESMARESTIA (*Lamour.*),—in honour of *A. G. Desmarest*, a celebrated French naturalist.

DESMARESTIA *viridis*; frond cylindrical, filiform, repeatedly pinnate; pinnæ and pinnulæ capillary, exactly opposite, patent.

DESMARESTIA *viridis*, *Lamour. Ess.* p. 25. *Endl. 3rd Suppl.* p. 28. *Harv. Man.* ed. 2. p. 24. *Kütz. Phyc. Gen.* p. 344. *Kütz. Sp. Ag.* p. 570.

DICHLORIA *viridis*, *Grev. Alg. Brit.* p. 39. t. 6. *Hook. Br. Fl.* vol. ii. p. 274. *Harv. in Mack. Fl. Hib.* part 3. p. 173. *Wyatt, Alg. Danm.* No. 56. *J. Ag. Sp. Alg.* vol. i. p. 164.

SPOROCHNUS *viridis*, *Ag. Sp. Alg.* vol. i. p. 154. *Ag. Syst.* p. 259. *Grev. Fl. Edin.* p. 287.

CHORDARIA *viridis*, *Ag. Syn.* p. 14. *Hook. Fl. Scot.* part 2. p. 98.

GIGARTINA *viridis*, *Lyngb. Hyd. Dan.* p. 44.

FUCUS *viridis*, *Fl. Dan.* t. 886. *Esper, Ic. Fuc.* t. 114. *Stack. Ner. Brit.* t. 17. *Turn. Syn.* vol. ii. p. 397. *Turn. Hist.* t. 97. *E. Bot.* t. 1669.

HAB. In the sea, growing on stones and the larger algæ between tide-marks, and below low-water mark. Annual. Spring and early summer. Not uncommon.

GEOGR. DISTR. Atlantic shores of Europe and America. Northern Pacific, and Southern and Antarctic Oceans.

DESCR. *Root* a scutate disc. *Fronde*s from two to three feet in length, filiform, from a quarter to half a line in diameter at the base, gradually attenuated upwards to an extreme fineness, excessively branched, having an ovate outline, the lower branches long, the upper gradually shorter. All the branches, and every one of the lesser divisions, down to the most minute ramulus, are exactly opposite and distichous; the larger divisions patent or nearly horizontal, the lesser gradually more erect. In a young state the branches and ramuli terminate in excessively fine, articulated, confervoid filaments, which gradually become coated with cells, and thus opaque; the confervoid filament being then encased, and changed into the axis of the compound frond. *Structure* densely cellular, with large air-cells dispersed through the cellular substance; the axile filament very slender. *Colour*, when growing, a deep brown-olive, or "foxy," quickly becoming verdegris-green when removed from the water. *Substance* soft and flaccid, soon decomposing.

There is no British alga with which this beautiful plant can well be confounded. The extreme delicacy of its capillary ramuli, the constantly exact opposition of all its parts, from the primary branches to the most minute of the decompound ramuli (the last of which are much finer than the most slender hair), and the versatile colour, are all marks which peculiarly belong to *Desmarestia viridis*. Old and weather-beaten fronds, which have lost the more delicate ramuli, have something the aspect of *Dictyosiphon fœniculaceus*, but may at once be distinguished by the opposite branching.

At Fig. 2 I have represented the magnified appearance of one of the growing points of the young frond, showing the gradual coating of the confervoid frame-work (or *skeleton*) of the frond. It will be seen that all the younger portions consist of a simple string of cells, or *articulated filament*, and that in the lower part these cells are coated by a stratum of much smaller cellules. As the growth proceeds these external coats are constantly increased, while the original central *skeleton* may still be traced, through all the branches, and even in the stem, a section of which is seen at Fig. 3.

D. viridis is very widely dispersed through the colder zones, both north and south, and increases in luxuriance as it approaches either pole.

Fig. 1. DESMARESTIA VIRIDIS :—*the natural size*. 2. A growing apex of a young branch :—*highly magnified*. 3. A transverse section of the stem :—*magnified*.



PLATE LXIV.

ARTHROCLADIA VILLOSA, *Duby*.

GEN. CHAR. *Frond* filiform, cellular, with an articulated, tubular axis, nodose; the nodes producing whorls of delicate, jointed filaments. *Fructification*; pedicellate, moniliform pods, borne on the filaments, and containing, at maturity, a string of elliptical spores. ARTHROCLADIA (*Duby*)—from ἀρθρον, a joint, and κλάδος, a branch.

ARTHROCLADIA villosa.

ARTHROCLADIA villosa, *Duby*, *Mem. Ceram.* p. 18 (1832). *J. Ag. Alg. Medit.* p. 43. *Endl. 3rd Suppl.* p. 25. *Kütz. Phyc. Gen.* p. 344.

ELAIONEMA villosum, *Berk. Glean.* p. 49. t. 19. f. 3 (1833). *Harv. Man.* p. 28.

SPOROCHNUS villosus, *Ag. Sp. Alg.* vol. i. p. 155. *Ag. Syst.* p. 260. *Grev. Alg. Brit.* p. 42. *Hook. Br. Fl.* vol. ii. p. 274. *Wyatt, Alg. Danm.* no. 105. *Harv. in Mack. Fl. Hib.* part 3. p. 173.

CONFERVA villosa, *Huds. Fl. Ang.* p. 603. *With.* vol. iv. p. 141. *E. Bot.* t. 546. *Dillw. Conf.* t. 37. *Roth. Cat. Bot.* vol. iii. p. 314.

HAB. On submarine rocks, shells, &c., and on *Zostera*, in four or five fathoms water, rare. Annual. Summer and Autumn. Southern coasts of England, not uncommon. Yarmouth, *Turner*. Anglesea, *Rev. H. Davies*. Frith of Forth, *Mr. Hasell*. Ardhur, *Capt. Carmichael*. Wicklow, *W. H. H.* Malahide, and Carrickfergus, *Mr. Mc'Calla*. Jersey, *Miss White and Miss Turner*.

GEOGR. DISTR. Atlantic shores of Europe. Baltic sea. Mediterranean sea, (very rare).

DESCR. *Root*, a minute disc. *Fronds* several from the same base, from six inches to nearly three feet in length, very slender, once, twice, or thrice pinnated; the pinnæ distant, opposite, or rarely alternate, patent, simple or again pinnated with similar, simple pinnules; all the branches furnished at intervals of from half a line to a line, with minute, knob-like swellings which produce whorls of very delicate, byssoid, repeatedly pinnate jointed filaments of a pale green colour. The substance of the frond is traversed by a wide tube, about one third of the width, which is divided by transverse septa into joints or chambers, whose length is rather less than their breadth, and four or five of which interpose between every whorl of filaments. This tube is surrounded by a row of large cellules, and these again by several rows of smaller ones, which gradually diminish to the circumference. The substance when quite fresh is cartilaginous, but it soon becomes flaccid. *Fructification*; minute, articulated, lanceolate pods (*stichidia*) borne along the sides of the whorled filaments; at first short, finally much lengthened, moniliform, and containing, at maturity, in each joint, an oval spore of an olive colour, which at length bursts through the membrane and falls away. In drying it adheres firmly to paper.

This elegant plant, which was formerly included in the genus *Sporochnus*, was, nearly at the same time, by M. Duby in France, and by the Rev. M. J. Berkeley in this country, proposed as the type of a distinct genus. M. Duby's name, having the priority of a few months, is here adopted. Of the propriety of constituting a new genus in this instance, there can be no question, both the structure of the frond, and the nature of the fructification being very unlike that of the *Sporochni*. There is, indeed, a much closer connection with *Desmarestia*, both in habit and in structure, and it is very probable that the fruit of *Desmarestia* may prove to be analogous to that of the present genus. At a first glance the difference in the structure of the frond between *Desmarestia* and *Arthrocladia* appears considerable, but a closer examination removes much of the dissimilarity. A jointed tube runs through the centre of both fronds; in the *Desmarestia*, in the form of a slender filament; in the *Arthrocladia* of a wide tube. The confervoid filaments are of the same nature in both genera, and the branching of the fronds identical. The great difference lies in the comparative density of structure.

Dr. Greville mentions that Mr. Hasell, the discoverer of *A. villosa* in Scotland, observed that "fresh specimens when spread upon paper, rendered it transparent, as if it had been touched with oil; but in a very short time the transparency quite disappeared." This property is not peculiar to this species, but exists also in young specimens of *Desmarestia ligulata*, and *D. herbacea*, and perhaps of others of the family, and affords another evidence of the strong natural connection of these plants. Another common point of resemblance consists in their soon becoming flaccid and changing to a verdigris green colour on exposure to the atmosphere, and then causing the rapid decomposition of any other delicate Alga in contact with them. This is common to all the *Sporochnoideæ*.

Fig. 1. ARTHROCLADIA VILLOSA :—*natural size*. 2. Part of a branch, showing a whorl of filaments. 3. Longitudinal section of the frond. 4. A transverse section of the same. 5. Pods of fructification :—*more or less highly magnified*.

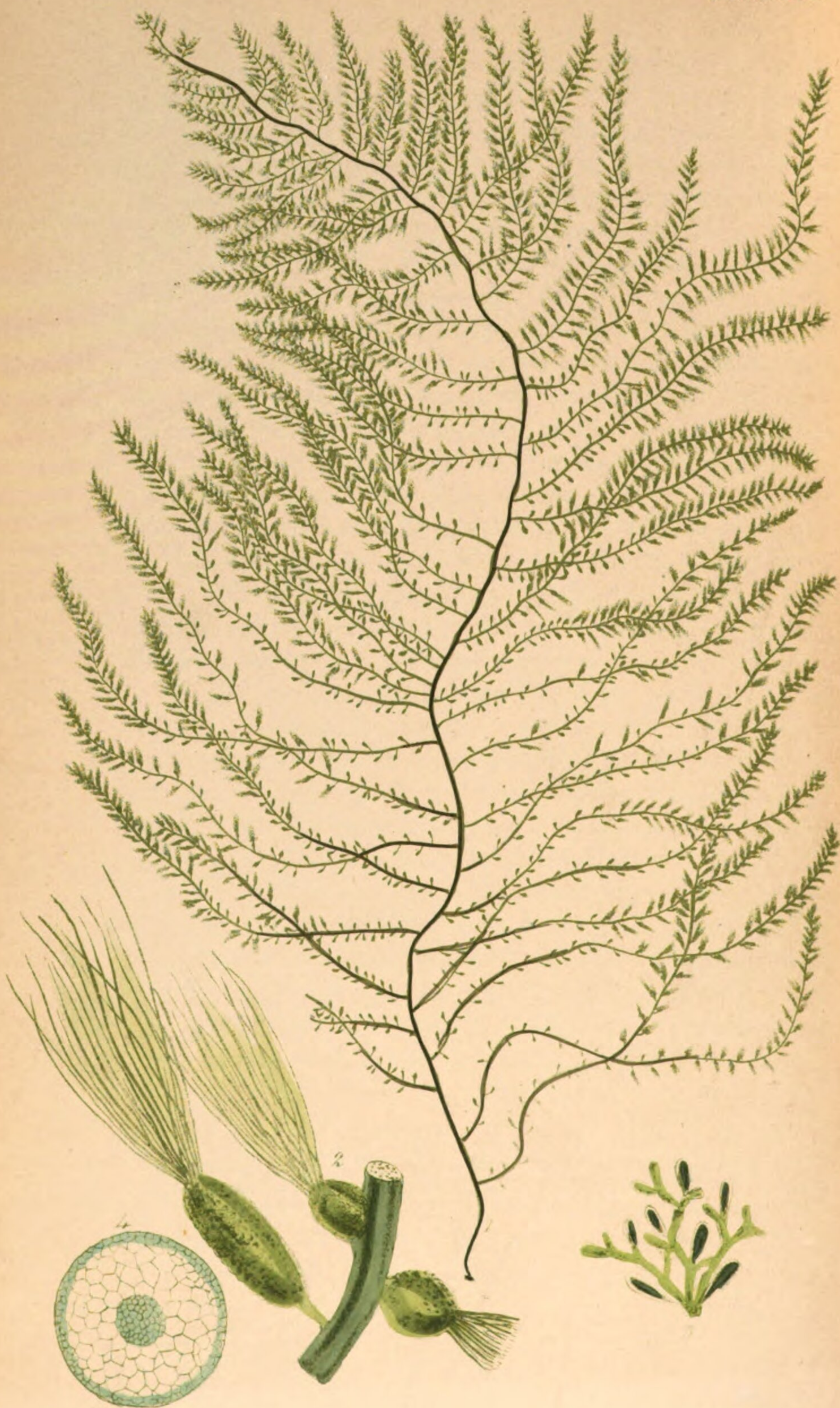


PLATE LVI.

SPOROCHNUS PEDUNCULATUS, *Ag.*

GEN. CHAR. *Frond* filiform, solid, cellular, the axis more dense. *Fructification*; lateral, crested, stalked *receptacles* composed of horizontal, branching filaments whorled round a central axis, and producing obovate *spores*. *Crest* deciduous, consisting of byssoid, jointed fibres. —SPOROCHNUS (*Ag.*), σπόρος, a seed, and χνούς, wool; because tufts of fibres accompany the fructification.

SPOROCHNUS *pedunculatus*; stem undivided; branches lateral, long, simple, horizontal; receptacles elliptical.

SPOROCHNUS *pedunculatus*, *Ag. Sp. Alg.* vol. 1. p. 149. *Syst.* p. 259. *Grev. Alg. Brit.* p. 41. t. vi. *Hook. Br. Fl.* vol. ii. p. 274. *Harv. in Mack. Fl. Hib.* part 3. p. 173. *Wyatt, Alg. Danm.* no. 104. *Harv. Man.* p. 27. *Endl. 3rd Suppl.* p. 28. *Kütz. Phyc. Gen.* p. 342.

GIGARTINA *pedunculata*, *Lam. Ess.* p. 48.

FUCUS *pedunculatus*, *Huds. Fl. Ang.* p. 587. *With.* vol. iv. p. 120. *Stack. Ner. Brit.* p. 110. t. 16. *E. Bot.* t. 545. *Turn. Syn.* vol. ii. p. 367. *Turn. Hist.* t. 188.

HAB. On submarine rocks, shells, &c., near low water mark, and at a greater depth; rare. Annual. Summer and Autumn. Eastern and southern coasts of England. Anglesea, *Rev. H. Davies*. Preston Pans, Frith of Forth, *Mr. Hasell*. Bantry Bay, *Miss Hutchins*. Killiney, *W.H.H.* Belfast Bay, *Mr. W. Thompson*. Malahide, and Roundstone Bay, *Mr. Mc' Calla*. Jersey, *Miss White*.

GEOGR. DISTR. Atlantic shores of France. British Islands.

DESCR. *Root* a small disc. *Stem* 6–18 inches long, as thick as hog's bristle, cylindrical, smooth, perfectly simple, furnished throughout its length with numerous lateral branches, at distances of from one to four lines asunder. *Branches* three to six inches long, half the diameter of the stem, gradually tapering to a fine point, quite simple, like the stem, the whole margined throughout with receptacles. The *receptacles* are at first sessile and wart-like, gradually they become stalked, the stalk varying, at different ages, and in different specimens, from a quarter of a line to nearly two lines in length. They are of an oblong-elliptical, or, finally, spindle form, and are crowned with a pencil of delicate byssoid, simple, jointed fibres a quarter of an inch in length, and finally deciduous. Their structure consists in a slender cellular axis, round which dichotomous, jointed, horizontal filaments are whorled. To these filaments the narrow obovate spores are attached. *Substance* cartilaginous, tender, becoming more rigid in the stem. The structure is cellular, the cells of the centre and those near the surface being minute; the intermediate ones large, lax, and polygonal. *Colour* when fresh, a clear olive, drying to a yellow green, and becoming brown in age. When young the plant adheres closely to paper in drying.

Sporochnus pedunculatus, though found in several widely separated places on the English and Irish coasts, is nowhere very common, and thus recommends itself by its rarity, as well as its beauty, to the collector. Few objects, indeed, are more attractive to the eye of a botanist than a fine frond of this species, as it waves its feathery branches in the water; but were the use of the dredge more general with algologists, this, and many other deep water plants, would, probably cease to be regarded as of rare occurrence; and we should be better acquainted with their habits, and the exact localities which they frequent. Most of the specimens now collected, are washed up by the tide, frequently in an imperfect, or decaying condition; or picked out of fishermen's nets, in the meshes of which they get entangled and torn. If raised by the dredge they would not only be found more perfect, but in far greater plenty.

Hudson was the first to describe this species, in his 'Flora Anglica.' It is of rare occurrence on the Continent, and has not been found out of Europe. Agardh regards as a distinct species, a Spanish plant which closely resembles it, and which differs chiefly from our *S. pedunculatus*, in the form of the receptacles. It is not improbable that this also may be found on our southern shores.

The genus *Sporochnus*, as now restricted, contains four or five species, none of which, except the present, have yet been found in Britain. They are natives of the warmer parts of the Temperate zones of both hemispheres, where they inhabit deep, quiet bays. Those of New Holland are of a much larger size than our British species, but have a very similar habit.

Fig. 1. SPOROCHNUS PEDUNCULATUS:—*the natural size*. 2. Receptacles of different ages. 3, A filament from the same. 4. A transverse section of the stem:—*all magnified*.



PLATE XIV.

CARPOMITRA CABRERÆ, Kütz.

GEN. CHAR. *Frond* linear, dichotomous, flat and mid-ribbed (or filiform), olivaceous. *Fructification*, mitriform receptacles terminating the branches, composed of horizontal branching filaments whorled round a vertical axis and producing elliptic-oblong seeds. CARPOMITRA— from *καρπὸς*, *fruit*, and *μίτρα*, a *cap* or *mitre*; mitre-fruit.

CARPOMITRA *Cabrerae*; frond irregularly dichotomous, linear, narrow, flat, mid-ribbed; branches here and there constricted.

CARPOMITRA *Cabrerae*, Kütz. *Phyc. Gen.* p. 343.

SPOROCHNUS *Cabrera*, *Ag. Sp. Alg.* vol. i. p. 156. *Syst.* p. 260. *Grev. Syn.* p. xl. *Harv. in Mack. Fl. Hib.* part 3rd. p. 154. *Man.* p. 28. *Endl. 3rd Suppl.* p. 28.

FUCUS *Cabrera*, *Clemente Ess.* p. 313. *Turn. Hist. Fuc.* t. 140.

HAB. Extremely rare. Beach at Youghal, 1833, *Miss Ball*.

GEOGR. DISTR. Cadiz, *Clemente*. South of Ireland.

DESC. *Root* a shapeless tuber. *Stems* 6–8 inches high, much branched in an irregularly dichotomous manner, flat, more or less distinctly mid-ribbed, coriaceous-membranaceous. *Branches* erect, with acute axils, distichous, alternate, narrow below, becoming rather broader upwards, here and there constricted, the apices truncate and often discoloured. *Colour* a light brown. The *frond* consists of two strata; the inner composed of large, colourless, polygonal cells, through which the immersed mid-rib runs; the outer, together with the mid-rib, of very minute coloured cells in a single layer. *Fruit* formed upon the thickened apex of the mid-ribs of the branches, mitriform, minutely capitate, having a central, densely cellular, cylindrical axis round which branching, horizontal articulated filaments are whorled. The lower joints of these filaments are slender, the upper beaded, and the terminal joint—which contains minute bodies, probably the remains of spermatozoa—oblatelly elliptical. *Spores* pedicellate, linear elliptical, borne toward the base of the whorled filaments.

The phanerogamous Flora of Ireland includes so many plants, natives of Spain and Portugal, that it ought not to excite surprise when a Spanish sea-weed occurs on our coasts. And yet, specimens of *C. Cabrerae* having never been found but once, and then only washed on shore, we may be allowed to entertain the fear that this interesting plant is not truly the growth of our shores, but wafted hither, as extra-European productions sometimes are, by the force of currents. Even should this be so, it is

well to record the circumstance by a figure representing one of the specimens picked up on the Irish coast, for which, among many others, the University Herbarium is indebted to the liberality of Miss Ball, a lady who has done much to illustrate the Irish Cryptogamic Flora. The present plant is in many respects the most interesting of her discoveries, should it eventually be established as a British species. Even on the continent, as far as we know, it is an extremely local and rare species, and is the only member of the genus to which it belongs which occurs in a northern latitude.

The name *Carpomitra* is proposed by Kützinger for those species of the Agardhian genus *Sporochnus* which have *terminal, sessile fruit*, namely *C. Cabrerae* and *C. inermis*. With the latter species I am unacquainted, except by Turner's figure, and am not quite sure that it is a congener; but another species (*C. Haliseris*, Harv.) recently described by Dr. Hooker and myself, is closely related to *C. Cabrerae*, from which it chiefly differs in having a frond nearly as wide and as distinctly ribbed as *Haliseris poly-podioides*. It is a native of New Zealand. We thus have a new instance, interesting because occurring in so limited and peculiar a genus, of analogous forms inhabiting similar climates of the northern and southern hemisphere.

C. Cabrerae was first described by Clemente in his list of Spanish Algæ, published 1804, being named by him "in honour of one of his fellow-labourers in the investigation of the botany of Spain, Don Antonia Cabrera, Canon of the Church of Cadiz, and it must be allowed," continues Mr. Turner, "that he has chosen for his friend a curious plant."—There is no British Alga with which the student can well confound it. Some very narrow varieties of *Dictyota dichotoma* faintly resemble it, but it requires a very slight examination to distinguish it from them.

Fig. 1. CARPOMITRA CABRERÆ:—*natural size*. 2. Part of a branch, showing the barren and fertile apices. 3. View of the surface of the frond. 4. Transverse section of a branch. 5. Receptacle of fruit. 6. Transverse section of the same. 7. Verticillate filaments, and spores from the same:—*all magnified*.





PLATE LXXIX.

ALARIA ESCULENTA, Grev.

GEN. CHAR. *Root* fibrous. *Frond* stipitate, membranaceous, furnished with a percurrent, cartilaginous midrib; the stipes pinnated with ribless leaflets. *Fructification*, an oblong sorus, formed of pyriform, vertical tetraspores, and situate in the accessory leaflets. ALARIA (Grev.),—from *ala*, a wing; in allusion to the winged frond.

ALARIA *esculenta*; frond elongated, lanceolate, entire; rib narrow, cylindrical; leaflets linear-oblong or cuneate.

ALARIA *esculenta*, Grev. *Alg. Brit.* p. 25. t. 4. Hook. *Brit. Fl.* vol. ii. p. 271. Harv. in Mack. *Fl. Hib.* part 3. p. 171. Wyatt, *Alg. Danm.* no. 203. Harv. *Man.* p. 23. Post. and Rupp. p. 11. t. 17. Endl. *3rd Suppl.* p. 28. Kütz. *Phyc. Gen.* p. 347. t. 32. f. 1.

LAMINARIA *esculenta*, Lyngb. *Hyd. Dan.* p. 23. Ag. *Sp. Alg.* vol. i. p. 110. Syst. p. 269. Hook. *Fl. Scot.* part 2. p. 98. Grev. *Fl. Edin.* p. 282. La Pylaie, *Ann. Sc. Nat.* vol. iv. p. 178. t. 9. f. D-F. Spreng. *Syst. Veg.* vol. iv. p. 326.

AGARUM *esculentum*, Bory. *Dict. Class. Nat. Hist.* vol. ix. p. 194.

FUCUS *esculentus*, Linn. *Mant.* p. 135. *Fl. Dan.* p. 364. *Syst. Nat.* vol. ii. p. 718. Gmel. *Syst. Nat.* vol. ii. p. 1389. *Fl. Dan.* t. 417. *Lightf. Fl. Scot.* vol. ii. p. 938. t. 28. Huds. *Fl. Ang.* p. 578. With. vol. iv. p. 93. Turn. *Syn. Fuc.* vol. i. p. 104. Turn. *Hist.* t. 117. Eng. *Bot.* t. 1759. Esper. *Ic. Fuc.* vol. ii. p. 30. t. 126.

FUCUS *fimbriatus*, Gm. *Hist. Fuc.* p. 200. t. 29. f. 1.

FUCUS *tetragonus*, Good. and Woodw. in Linn. *Trans.* vol. iii. p. 140.

FUCUS *teres*, Good. and Woodw. in Linn. *Trans.* vol. iii. p. 140.

FUCUS *pinnatus*, Fl. *Norv.* vol. i. p. 96.

FUCUS *scoticus latissimus edulis dulcis*, Raii. *Syn.* p. 46. n. 30.

HAB. Fringing precipitous rocks, at low-water mark. Perennial. Winter and spring. Abundant on the shores of Scotland, and of the north and west of Ireland. Cumberland, Hudson. Anglesea and Isle of Man, Rev. H. Davies. Durham and Northumberland, Winch. Cornwall, Turner. North coast of Devonshire, Mrs. Griffiths. Weymouth, Stackhouse. Orkney, Rev. Mr. Clouston.

GEOGR. DISTR. Abundant in the Arctic Ocean and Northern Atlantic. Iceland, Lyngbye. Northern Pacific. Sitka. Kamtschatka. Atlantic shores of France, Lenormand.

DESCR. *Root* consisting of several radiating, cylindrical, branching and grasping fibres. *Stem* as thick as a small goose-quill, naked in its lower part for the length of 2-4 inches; then pinnated with leaflets for 1-3 inches more, and finally terminating in the midrib of the frond. *Leaflets* numerous, 2-4 inches in length, and from a quarter to half an inch in breadth, rib-less, filiform at the base, gradually widening upwards, generally obtuse. *Frond*, when fully grown, from 3-20 feet in length, and from 2-8 inches in breadth, membranaceous, entire, splitting obliquely towards the midrib, linear or lanceolate, tapering to each extremity, the surface perforated with minute pores, producing tufts of fibres. *Fructification* forming an oblong, reddish brown,

thickened sorus, on both surfaces of the leaflets, consisting of a vast number of narrow-pyriform, stipitate, vertical *spores*, closely packed together, and each separating at maturity into four sporules, in a cruciate manner. *Colour* a transparent yellowish olive.

This beautiful plant, which is scarcely known on the southern coasts of England, abounds on all the Atlantic shores of the British Islands, and extends throughout the whole of the northern Atlantic and Pacific Oceans. The roughest water seems to be most favourable to its existence, and I observe that it reaches its greatest size and most luxuriant growth on some of the most exposed parts of our western coasts. Yet the delicate membrane of its leaf is easily torn, and in large specimens is very rarely found free from laceration.

It appears to be perennial; the new growth being produced at the base of the leafy-frond, as observed by Mrs. Griffiths in all the *Laminariæ*. This portion is always of a much paler colour than the old, and soon after the commencement of the growing season, the line of demarcation becomes distinctly visible: and when it has progressed for some time, a contraction takes place at the base of the old leaf, which gradually increases till the latter falls, and a new frond is formed. The renewal of the leaflets appears to be conducted in a similar manner.

The *fructification* commonly to be met with on full grown specimens, consists of innumerable slender spores, closely packed together, which according to Dr. Joseph Hooker, are compounded of four sporules, divided by two lines, crossing at right angles. The same close observer has discovered similar *tetraspores* in many others of the *Laminariæ*, in which, previously, the spores were supposed to be simple.

Alaria esculenta is eaten in some parts of Scotland, and Ireland, as well as in Iceland, and the Fœroe Islands. For this purpose the midrib, stripped of its membrane, only is used. It has a sweetish taste, but is rather insipid. In Scotland it is called Badderlocks or Hen-Ware; and in Ireland, according to Dr. Drummond, Murlins.

Four other species, all nearly allied to this, are known to botanists. They are natives of the northern shores of North America, and of Asia.

Fig. 1. *ALARIA ESCULENTA*; a small specimen:—*of the natural size*. 2. A leaflet with a sorus:—*slightly magnified*. 3. Section of the sorus. 4. Some of the spores removed:—*highly magnified*.





2.



4.

3.

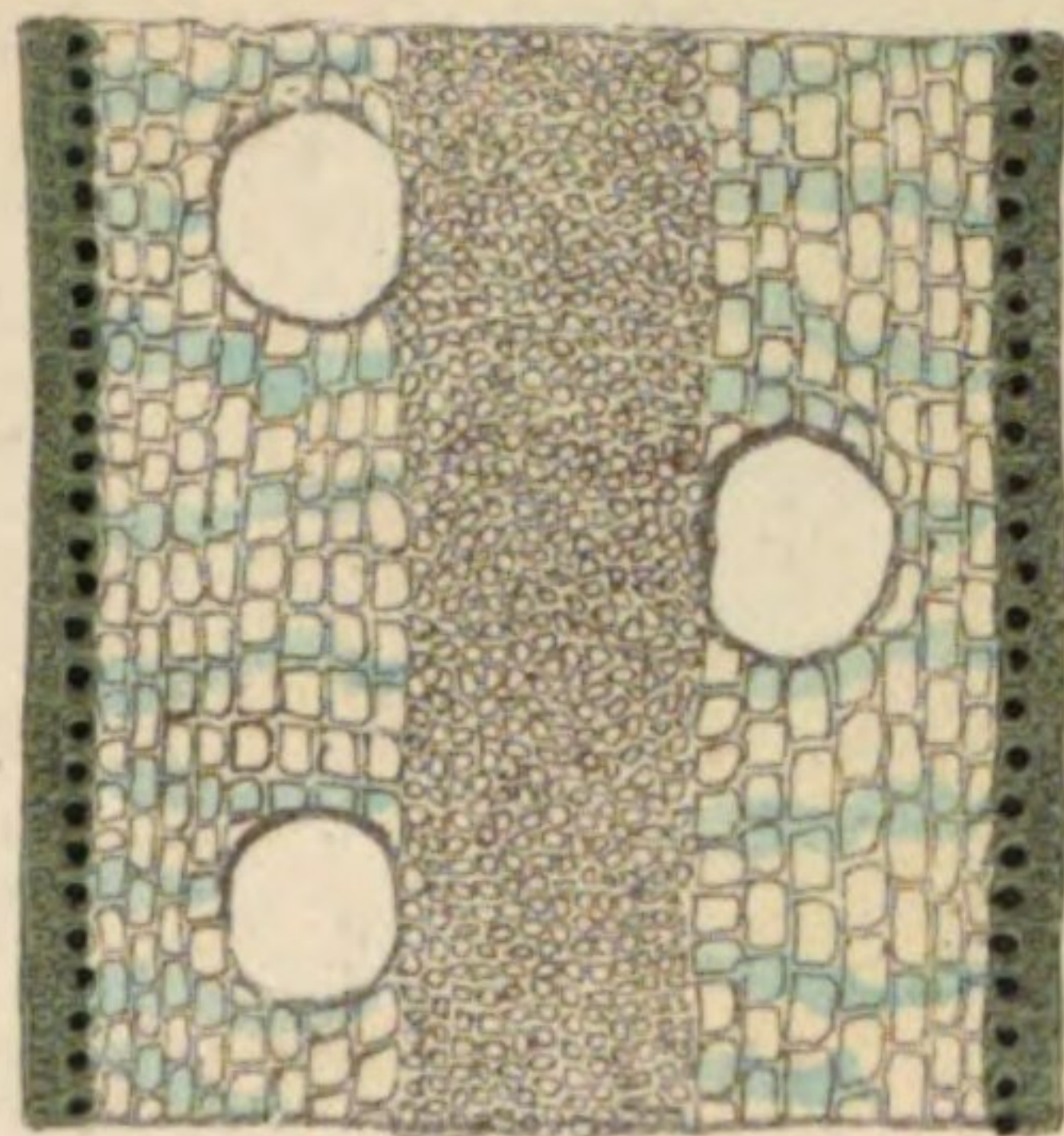


PLATE CCXXIII.

LAMINARIA DIGITATA, *Lamour*.

GEN. CHAR. *Frond* stipitate, coriaceous or membranaceous, flat, undivided or irregularly cleft, ribless. *Fructification*; cloudy spots of spores, imbedded in the thickened surface of some part of the frond. LAMINARIA (*Lamour*.),—from *lamina*, a thin plate, in allusion to the flat frond.

LAMINARIA *digitata*; stem long, woody, cylindrical, gradually tapering and somewhat compressed upwards, expanding into a leathery, roundish-oblong frond, deeply cleft into many linear segments.

LAMINARIA *digitata*, *Lamour. Ess.* p. 22. *Lyngb. Hyd. Dan.* p. 20. *Ag. Sp. Alg.* vol. i. p. 112. *Ag. Syst.* p. 270. *Grev. Alg. Brit.* p. 27. *Hook. Br. Fl.* vol. ii. p. 271. *Harv. in Mack. Fl. Hib.* part 3. p. 171. *Harv. Man.* p. 23. *Wyatt, Alg. Danm.* No. 156. *Endl. 3rd. Suppl.* p. 27. *Post. and Rupr. t.* 12. *J. Ag. Sp. Alg.* vol. i. p. 134.

LAMINARIA *stenoloba*, *De Lap. Terr. Neuv.* p. 55.

HAFGYGIA *digitata*, *Kütz. Phyc. Gen.* p. 346. t. 30. and 31.

FUCUS *digitatus*, *Linn. Mant.* p. 134. *Fl. Dan.* t. 392. *Stack, Ner. Brit.* p. 5. t. 3. *Esper*, p. 99. t. 48, 49. *Huds. Fl. Angl.* p. 579. *Lightf. Fl. Scot.* p. 935. *With.* 4. p. 98. *Linn. Trans.* 3. p. 152. *Turn. Syn.* p. 207. *Turn. Hist.* t. 162. *E. Bot.* t. 2274.

FUCUS *hyperboreus*, *Gunn. Fl. Norv.* 1. p. 34. t. 3.

HAB. On rocks in the sea, beyond the reach of the tide, extending to the depth of about fifteen fathoms. Perennial. Winter. Abundant on the shores of the British Islands.

GEOGR. DISTR. The Icy sea, and Northern Atlantic, from Norway to Spain, and from Greenland to the shores of Massachusetts (*at least*). Kamtschatka.

DESCR. *Root*, a conical mass composed of numerous, stout, branching fibres, each of whose branches ends in a flattened disc which takes a strong hold of the rocky bottom. *Stem* from two to six feet long, cylindrical, solid, in large specimens upwards of an inch in diameter near the base, gradually tapering upwards and becoming compressed towards the summit, where it passes into the base of the frond. *Frond* from one to five feet long, and from one to three feet in breadth, deeply cleft from the apex nearly to the base into an uncertain number of linear, strap-shaped, acute or obtuse segments. *Fructification* dark coloured, cloud-like patches, seen on old fronds, consisting of a stratum of innumerable, minute, angular, dark-coloured spores, concealed beneath the surface cells. *Substance* in the stem woody, but flexible, hard and horny when dry; in the frond, leathery. *Structure* cellular; the cells of the central portion of stem and frond very minute; those of the periphery larger; in the frond quadrate, with spherical air-cells at intervals. *Colour*, a fine clear olive, becoming darker in age.

A well known plant, the common *Sea-girdles* or *Tangle*, which grows to a large size on all rocky coasts. Our figure may appear a caricature to persons acquainted only with the plant in the state in which it is usually cast ashore, but I have purposely selected a specimen to illustrate its very curious mode of growth. The root and stem are perennial, but the many-cleft leaf is renewed every season and the old one cast off. Our specimen represents the nearly perfectly formed leaf of the present season and the base of the leaf of last year adhering to the tips of its segments. The mode of growth is as follows: As soon as the existing frond has served its purpose and begins to grow brown, an expansion commences between its base and the apex of the stem. This expansion continues to increase in length and breadth till it has attained a considerable size. We have then a large ovate lobe at the apex of the stem, separated by a deep constriction from the old frond. As yet this lobe is quite entire; but after a while longitudinal splits, commencing near its margin, and continuing towards its centre begin to appear. These widen and lengthen by degrees, and at last the outer ones reach the decaying base of the old frond; a rupture ensues, and the tip of the new segment is free. This process is continued, until, when many segments have thus been formed, the connection between the old leaf and the now nearly perfect new one is so much weakened, that the former adheres by a very small surface, and is soon cast off altogether. Our figure is taken from a specimen in which this is about to take place.

This mode of growth appears common to all the *Laminariæ*, in many of which Mrs. Griffiths has been the first to observe it; and I take this opportunity of expressing my warmest thanks to that lady for a magnificent suite of the present species, exhibiting the growing frond in all stages of its development.

Fig. 1. Plant of *LAMINARIA DIGITATA*, (small), just before casting the frond of the previous season. 2. Young seedling plant:—*both of the natural size*. 3. Section of the frond, with spores and air cells *in situ*. 4. Spores:—*both magnified*.





Reeve & Nichols imp.

W. H. H. del et lith.

PLATE CCCXXXVIII.

LAMINARIA DIGITATA,

Var. STENOPHYLLA.

LAMINARIA digitata stenophylla; whole plant dark brown; stipes slender, flaccid, glossy, becoming compressed or flattened upwards; lamina wedge-shaped and tapering at base, much longer than the stipe, digitate, its segments few, and very narrow.

HAFGYGIA digitata, var. *stenophylla*, *Kütz. Sp. Alg.* p. 577.

LAMINARIA conica, *Bory, Dict. Cl. d'Hist. Nat.* vol. ix. p. 190.

HAB. Common round the shores of the Orkney Islands, and the North of Ireland.

On Plate CCXXIII. I have figured a small specimen of the ordinary form of *L. digitata*, and given a detailed description of the species; and I here figure an equally small specimen of what is either a remarkable variety of that species or entitled to specific distinction. My attention was first drawn to it by my friend the *Rev. J. H. Pollexfen*, who directed me to some excellent remarks on these *Laminariæ*, furnished by *Rev. C. Clouston*, of Orkney, to 'Anderson's Guide to the Highlands and Islands of Scotland.'

The differences between these varieties are so marked, that the Orkney kelp-men have assigned peculiar local names to each, calling the ordinary *L. digitata* (Plate CCXXIII.) *Cuvy*, and the form here figured *Tangle*. I extract the following contrasted characters of each from Mr. Clouston's memoir:—

"*Root.* The fibres of the root of the *Cuvy* (*L. digitata vera*) are arranged in longitudinal lines or rows, not whorls; while the fibres of the *Tangle* (*L. d. stenophylla*) have no order at all. This arrangement of the fibres is particularly evident, as the plant is frequently thrown on shore, having all except the stumps worn away by friction.

"*Stipes.* The *stipes* of the *Cuvy* scarcely ever exceeds four or five feet in length, while its circumference near the root is sometimes seven inches. It is so stiff as to stand up almost perpendicular two-thirds of its height; but droops at the top from the weight of the frond. It is surrounded by a *rough* bark as thick as pasteboard, which may be separated from it. *Colour* light brown; much infested with parasitical plants, particularly the *Ptilota plumosa* and *R. palmata*, or Dulse. It tapers much towards the top, but retains its *round* figure till it spreads immediately into the frond. The lower end tastes very *salt*, and is *not* eatable. The *stipes* of the *Tangle*, on the contrary, frequently attains the length

of eight or ten feet, while its circumference seldom exceeds four inches. It is so *flexible* as to lie prostrate on the rocks; has a *smooth* polished surface, and no bark that can be separated, at least easily; *colour* very dark brown or black; rarely hurt by any parasitical plant: the top is considerably *flattened* some time before it expands into the frond, and the lower end tastes *sweet*, and is much eaten by some people.

“*Fronde*. The frond of the Cuvy is *thicker, shorter*, and the segments more numerous and *clustered*, than in the Tangle. That of the Cuvy swells into blisters by steeping in fresh water, while the frond of the Tangle bleaches white; but the great distinction in this part, and the one which makes this plant so valuable, is, that the Cuvy annually *throws off the old leaf*, and acquires a new one, while this has never been observed in the Tangle.” [Here follows an account of the shedding of the old fronds; the history then proceeds.] “The situations in which the two plants grow are also very different; the Cuvy growing so far out in the sea that the highest limit can only be approached at the lowest stream tides, and from this it runs into the ocean, as far as the eye can penetrate, and probably much farther; while the Tangle may be approached at ordinary tides, and forms a belt between the Cuvy and the beach. The general aspect also differs. The stems of the Cuvy stand up like a parcel of sticks, and the leaves wave from them like little flags; while the Tangles lie prostrate on the rocks, the leaves mingle together, and form a darker belt round the shore. Six or eight feet is reckoned a good length for a Cuvy, while Tangles may be found from twelve to twenty feet.”—*Anderson's Guide*, ed. 1. p. 721, 722.

I can bear witness to the accuracy of most of the above observations, having had, last summer, an opportunity of seeing, in the neighbourhood of the Giants' Causeway, both plants growing in profusion, and each retaining its peculiarities. The *Tangle* is strikingly obvious, from its dark colour, on the white limestone-rocks near Dunluce Castle, where it forms a clearly defined fringe round the bases of the cliffs. I have traced it from a few inches to many feet in length, and found it retain its form, and colour, and glossy, flaccid stipe; and so far as my opportunities of judging allow me to form an opinion, I am disposed to regard it as a *good species*. But perhaps a more careful observation, and comparison, may be necessary before this be definitively settled, and for the present I leave it as a form of *L. digitata*; recommending the varieties of that species, on all parts of the coast, to the study of observers. In drying the colour becomes olive.

In Mr. Edmondston's 'Flora of Shetland' (p. 54), the trivial name *digitata* is applied to the plant here figured; while the ordinary *L. digitata* (or Cuvy) is called *L. Cloustoni*, Edm.

Tab. CCCXXXVIII. A very young, and a more advanced specimen of *L. d. stenophylla*. Fig. 1. Small portion of a full-grown, compressed stipes:—all the figures *the natural size*.





W. H. H. del. et lith.

R. B. & R. imp.

PLATE CCXLI.

LAMINARIA BULBOSA, *Lamour.*

GEN. CHAR. *Frond* stipitate, coriaceous or membranaceous, flat, undivided or irregularly cleft, ribless. *Fructification*; cloudy spots of spores, imbedded in the thickened surface of some part of the frond. LAMINARIA (*Lamour.*),—from *lamina*, a thin plate, in allusion to the flat frond.

LAMINARIA *bulbosa*; stem flat, with a waved margin, once twisted at the base, rising from a roundish, hollow, warted tuber; frond oblong, deeply cleft into many linear segments.

LAMINARIA *bulbosa*, *Lamour. Ess.* p. 22. *Ag. Syn.* p. 18. *Lyngb. Hyd. Dan.* p. 21. *Hook. Fl. Scot.* part 2. p. 99. *Ag. Syst.* p. 271. *Ag. Sp. Alg.* vol. i. p. 114. *Grev. Alg. Brit.* p. 29. *Hook. Br. Fl.* vol. ii. p. 271. *Harv. in Mack. Fl. Hib.* part 3. p. 171. *Harv. Man.* p. 24. *Wyatt, Alg. Danm.* no. 4.

LAMINARIA *Belvisii*, *Ag. Sp. Alg.* vol. i. p. 115. *Ag. Syst.* p. 271.

SACCORHIZA *bulbosa*, *De la Pyl. Fl. Ter. New.* p. 23. *J. Ag. Sp. Alg.* vol. i. p. 137.

HALIGENIA *bulbosa*, *Dne. Ess.* p. 50. *Endl. 3rd. Suppl.* p. 27.

PHYCOCASTANUM *bulbosum*, *Kütz. Phyc. Gen.* p. 346.

FUCUS *bulbosus*, *Huds. Fl. Angl.* p. 579. *Linn. Trans.* vol. iii. p. 153. *Turn. Syn.* p. 212. *Esper, Ic.* t. 123. *E. Bot.* t. 1760. *Turn. Hist.* t. 161.

FUCUS *polyschides*, *Lightf. Fl. Scot.* p. 936. *With.* vol. iv. p. 97. *Stack. Ner. Brit.* t. 4.

FUCUS *palmatus*, *Gmel.* t. 30.

ULVA *bulbosa*, *DC. Fl. Fr.* vol. ii. p. 16.

HAB. On rocks at low-water mark, and to the depth of 10–15 fathoms. Perennial. Autumn. Abundant on the British shores.

GEOGR. DISTR. Shores of Europe from Norway to Spain. Ferroe Islands. Coast of Guinea, *Pal. de Beauvois.*

DESCR. *Root*, in the young state of the plant, composed of several clasping fibres, gradually perishing as the frond increases in size, and its place supplied by a hollow tuber which originates at a higher point on the stem. *Stem* at first slender and filiform, half a line in diameter and an inch in height, with a small dilatation like a collar a little above its middle; gradually becoming broader and quite flat, till, in large specimens, it is four or five feet long, and two or three inches wide, with the margin very much waved and curled. In these full-grown specimens, the collar-like swelling becomes dilated into a hollow tuber, from four inches to a foot in diameter, rough with wart-like or cylindrical fibrous projections. The portion of the stem below the tuber is either absorbed or perishes, and roots issue from the lower surface of the tuber to supply the place of the original holdfast: thus a new base is provided for the frond. *Frond* in young specimens membranaceous, oblong, or ovate, undivided; when full-grown coriaceous,

thick, from three to six feet in length, oblong, cloven into innumerable narrow, ribbon-like segments. *Spores* abundantly formed in the wavy margin of the stem, but not confined to this portion of the frond. They originate in the cells immediately beneath the surface, and are closely packed together, vertically, in large cloud-like sori; they are at first linear-clavate, at length elliptical; their perispore drawn out at base into a slender stipe. *Colour* a clear, brown olive; greenish when young. *Substance* more tender than in *L. digitata*.

This is the largest British species of the *Laminariæ*, its frond in some instances forming, when spread out on the ground, a circle twelve feet in diameter. Its common name is *Furbelows*, and its aspect must be familiar to most visitors of the sea-shore.

In modern systems it is generally separated from *Laminaria*, and no less than three generic names have recently been proposed for it, of which *Saccorhiza*, having the priority in publication, has been adopted by Prof. J. Agardh in his recent work. *L. bulbosa* differs somewhat, in habit, from other *Laminariæ*, and may perhaps be allowed to form a separate generic group; but the chief diagnostic character insisted on by the upholders of the change is not valid. It is asserted that the spores are confined to the frill of the stem. It is quite true that here they are most abundant; but they also occur in effused patches on the lamina, as in other *Laminariæ*.

I am indebted to my friend John Nuttall, Esq., of Titoor, for the specimen here figured, which is singularly characteristic of the full-grown plant, and yet of so small a size as to come easily into a quarto plate.

Fig. 1. LAMINARIA BULBOSA; a small, but fully formed specimen:—of the natural size. 2. Section, with spores, in situ:—magnified. 3. Spores, of various ages:—highly magnified.



PLATE CCCXXXIX.

LAMINARIA LONGICRURIS, *De la Pyl.*

GEN. CHAR. *Frond* stipitate, coriaceous or membranaceous, flat, undivided or irregularly cleft, ribless. *Fructification*, cloudy spots of spores, imbedded in the thickened surface of some part of the frond. LAMINARIA (*Lamour.*),—from *lamina*, a thin plate, in allusion to the flat frond.

LAMINARIA *longicruris*; stipes very long, slender at the base, hollow and inflated in the middle, and gradually tapering to the apex; frond undivided, ovato-lanceolate, membranaceous, obtuse.

LAMINARIA *longicruris*, *De la Pyl. An. Sc. Nat.* vol. iv. p. 177. t. 9. f. A. *Fl. Ter. Neuv.* p. 41. *Post. & Ruppr. Illustr.* p. 10. *J. Ag. Sp. Alg.* vol. i. p. 135. *Kütz. Sp. Alg.* p. 576. *Harv. Ner. Bor. Amer.* t. 6.

LAMINARIA *ophiura*, *Bory, Dict. Class.* vol. ix. p. 198.

HAB. Cast ashore. Island of Sanday, Orkney, *Mr. George Firth* (1838), fide *Rev. J. H. Pollexfen*. Coast at Gamnie, Banffshire, *Rev. G. Harris* (May 1850), fide *Prof. Dickie*. Ayrshire coast, *Rev. D. Landsborough* (July 1850). Near Dunluce Castle, county Antrim, *W. H. H.* (August 1850):—all the specimens much worn, and covered with barnacles.

GEOGR. DISTR. Northern Ocean, at Spitzbergen, *Vahl.* Baltic Sea, *J. Agardh.* Newfoundland (*De la Pylaie*), and common along the American shore as far south as Cape Cod, *W. H. H.* Bahama Islands, *Chauvin.* Kamtschatka, *Postells and Rupprecht.*

DESCR. *Root* of numerous, slender, and much branched clasping fibres, issuing at irregular intervals from the lower part of the stipe. *Stem* from eight to twelve feet in length, very slender at the base, and there solid, gradually widening upwards and soon becoming hollow; at length, toward the middle widened to upwards of an inch in diameter, thence tapering to the apex, and terminating in the broadly cuneate base of the lamina. *Lamina*, when full grown, six to eight feet in length and from two to three feet in width, oblong-lanceolate or oval, very much waved at the margins and obtuse at the apex, of thinner substance than in *L. saccharina*. *Colour* of the stem yellowish-brown, of the lamina a beautiful pale greenish-olive.

This is a very distinct and beautiful species, and one of the largest of the genus, the frond being frequently as large as a moderately-sized table-cloth. It abounds along the coast of

North America, as far south as Boston Bay, and is of particularly large dimensions, and in great abundance, in the deep harbour of Halifax. It would seem also, from its other recorded habitats, to be generally dispersed through the Arctic Sea. But what are its claims to a place in the British flora? At present they are extremely doubtful—all the specimens which have been found being merely the stipes, covered with barnacles, and deprived of both root and leaf. The *hollow* stipe, tapering to both ends, is, however, so remarkable that no mistake can be made in identifying the specimens. The question simply is, *where* were these specimens grown? By their colony of barnacles they must have been long adrift, and most probably they were wafted either from the shores of Greenland or the more distant American coasts, swept by the Gulf Stream. To us, therefore, they come with no better claim on our charity than the equally drifted fronds of *Sargassum*. But I am not without hope that future observations, in the bays of Shetland or Orkney, may establish a clearer title; for if *L. longicruris* be truly a native of the Baltic, as Agardh assures us, there is nothing improbable in its vegetating in our most northern bays. In general aspect it resembles *L. saccharina*, but the frond is proportionally broader and more blunt, and of thinner substance; while the very long stem, hollow and somewhat swollen in the middle, will always afford a clear mark of distinction. Our figure is taken from a specimen collected at Halifax, Nova Scotia.

Fig. 1. LAMINARIA LONGICRURIS:—on a reduced scale, of an inch to a foot.
2. A portion of the hollow stem:—the natural size.

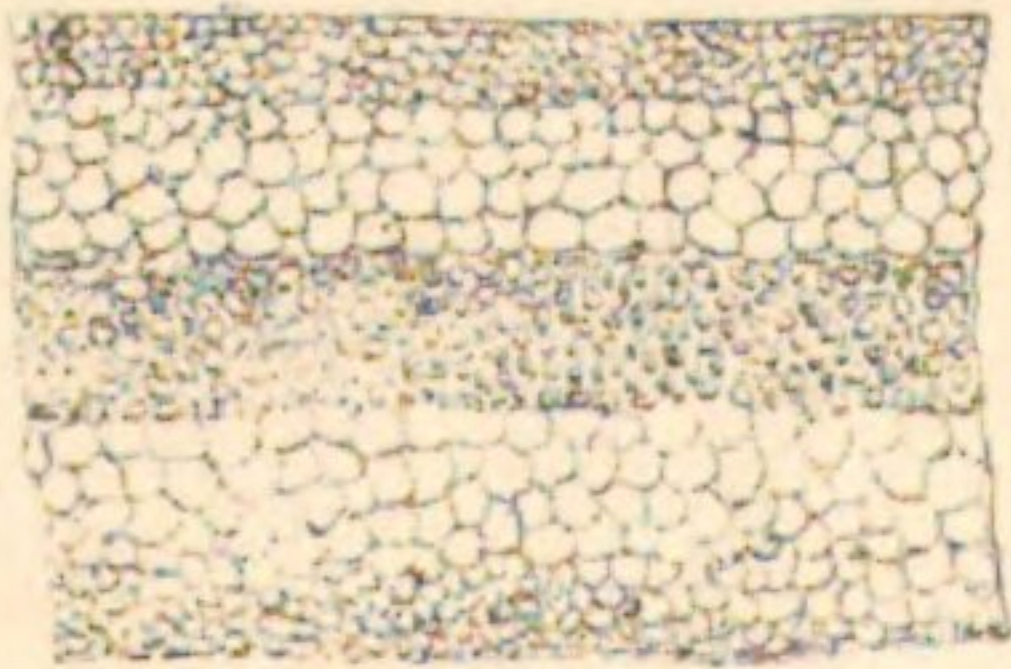




PLATE CCLXXXIX.

LAMINARIA SACCHARINA, *Lamour.*

GEN. CHAR. *Fronde* stipitate, coriaceous or membranaceous, flat, undivided or irregularly cleft, ribless. *Fructification*, cloudy spots of spores imbedded in the thickened surface of some part of the frond. LAMINARIA (*Lamour.*),—from *lamina*, a thin plate, in allusion to the flat frond.

LAMINARIA *saccharina*; stem cylindrical, filiform, expanding into a cartilaginous or submembranaceous, lanceolate, undivided frond.

LAMINARIA *saccharina*, *Lamour. Ess.* p. 22. *Lyngb. Hyd. Dan.* p. 21. t. 5. *Ag. Sp. Alg.* vol. i. p. 117. *Ag. Syst.* p. 272. *Hook. Fl. Scot.* part 2. p. 98. *Grev. Fl. Edin.* p. 282. *Grev. Alg. Brit.* p. 32. *Hook. Br. Fl.* vol. ii. p. 272. *Wyatt, Alg. Danm.* no. 54. *Harv. in Mack. Fl. Hib.* part 3. p. 171. *Harv. Man.* ed. 2. p. 30. *Endl. 3rd Suppl.* p. 27. *J. Ag. Sp. Alg.* vol. i. p. 134. *Kütz. Phyc. Gen.* t. 24. f. 1. *Kütz. Sp. Alg.* p. 574.

LAMINARIA *latifolia*, *Ag. Sp. Alg.* vol. i. p. 119. *Ag. Syst.* p. 272. *Grev. Alg. Brit.* p. 34. *Port. et Rupp.* p. 10. *Kütz. Syst. Alg.* p. 575.

FUCUS *saccharinus*, *Linn. Sp. Pl.* p. 1630. *Fl. Lapp.* p. 364. *Gm. Hist. Fuc.* p. 194. t. 27 & 28. *Huds. Fl. Angl.* p. 578. *Lightf. Fl. Scot.* vol. ii. p. 940. *Good. et Woodw. Linn. Trans.* vol. iii. p. 151. *Turn. Syn.* vol. ii. p. 198. *Turn. Hist.* t. 163. *Esper, Ic. Fuc.* vol. i. t. 24, 56, & 57. *Stack. Ner. Brit.* t. 9. *E. Bot.* t. 1376. *Fl. Dan.* t. 416.

HAB. Attached to rocks and stones near low-water mark, and to the depth of five to ten fathoms. Perennial. Very common all round the coast.

GEOGR. DISTR. Abundant in the Northern Ocean, extending round the world. Atlantic shores of Europe, as far as the south of France, and of North America as far as the Chesapeake (at least).

DESCR. *Root* consisting of several dichotomously branched, clasping fibres, extending from the base of the stem in a conical form, and fixed to the rock by discs or fibrils from their lower surface. *Stem* sometimes a few inches, sometimes several feet in length, from a quarter to half an inch in diameter, cylindrical, compressed above, and dilating into the base of a terminal, simple lamina. *Lamina* from one to six or even ten feet in length, and from two to twelve inches or more in breadth, lanceolate, acute or obtuse, sometimes much acuminate at the point; ovate at base when young, or more or less cuneate, rarely attenuate; the margin sometimes nearly flat and even, sometimes undulate or very much curled; the centre thicker and more opaque than the rest of the frond, and sometimes strongly rugose, with wavy transverse ribs, sometimes furrowed longitudinally at one surface of the frond and ribbed at the other, or variously bullated. *Fructification*, according to Turner, occupying irregularly shaped spots, in the centre of

the leaf, from half an inch to an inch in width, and of various lengths sometimes extending uninterruptedly throughout the frond, at other times broken without order. *Substance* varying, according to the circumstances under which the plant has been developed, from cartilaginous and coriaceous, which are most common, to delicately membranaceous. *Colour* of the leaf a deep olive, now greenish, now brownish, clear, semitransparent and glossy. As in all the *Laminariæ*, new growth in the frond takes place between the apex of the stem and base of the leaf, the upper portion of the leaf continually dropping off after the new portion is developed.

Every visitant of the sea-shore must be familiar with one form or other of this common plant, which forms a belt, about low-water mark, round all our rocky shores, where its long ribbon-like fronds wave gracefully in the water. It is by no means confined, however, within these limits, but grows in water from five to ten fathoms deep, attached to shells and stones, when rocks are not to be had. In such situations it often acquires a very large size. The variety called by Agardh *L. latifolia* delights in deep water, especially in sheltered bays and coves protected from the ocean by small islands. In many such places on the west of Ireland and Scotland, where the water is clear as crystal, the beautiful broad leaves of this variety may be seen growing luxuriantly several fathoms below the boat in which the observer is sailing over them.

A species with a simple frond and very long stem (*L. longicruris*), in many respects resembling *L. saccharina*, but readily distinguished by the stem becoming hollow, and increasing in diameter upwards, abounds in the Northern Ocean, and should be watched for on the shores of Orkney and Shetland.

Fig. 1. LAMINARIA SACCHARINA, a small specimen :—*the natural size*. 2. Thin slice :—*magnified*.



PLATE CXCH.

LAMINARIA PHYLLITIS, *Lamour*.

GEN. CHAR. *Frond* stipitate, coriaceous, or membranaceous, flat, undivided, or irregularly cleft, ribless. *Fructification*; cloudy spots of spores, imbedded in the thickened substance of some part of the frond.

LAMINARIA (*Lamour*.),—from *lamina*, a thin plate, in allusion to the flat frond.

LAMINARIA *phyllitis*; stipe short, subcompressed, gradually expanding into a linear-lanceolate, delicately membranaceous, undivided frond.

LAMINARIA *phyllitis*, *Lam. Ess.* p. 22. *Lyngb. Hyd. Dan.* p. 23. *Ag. Sp. Alg.* vol. i. p. 121. *Ag. Syst.* p. 273. *Spreng. Syst. Veg.* vol. iv. p. 325. *Grev. Alg. Brit.* p. 34. *Hook. Br. Fl.* vol. ii. p. 272. *Harv. in Mack. Fl. Hib.* part 3. p. 171. *Endl. 3rd Suppl.* p. 27. *Kütz. Phyc. Gen.* p. 345.

LAMINARIA *saccharina* (*young state*), *Hook. Fl. Scot.* part 2. p. 98.

LAMINARIA *saccharina*, var. *attenuata*, *Grev. Fl. Edin.* p. 282.

FUCUS *phyllitis*, *Stack. Ner. Brit.* t. 9. *Turn. Syn.* p. 193. *Turn. Hist.* t. 164. *E. Bot.* t. 1331. *Esper, Ic.* t. 149.

FUCUS *phyllitidis folio*, *Raii. Syn.* p. 40.

HAB. On rocks and stones, in pools left by the tide; also in four or five fathoms water. Biennial? Summer. Not uncommon. Coast of Dorsetshire, *Pulteney*. Portland Head and Tenby, *Stackhouse*. Sidmouth and Torquay, *Mrs. Griffiths*. Yarmouth, *Mr. Wigg*. Coast of Sussex, *Mr. Borrer*. Orkney, *Rev. J. H. Pollexfen* and *Dr. Mc'Bain*. Frith of Forth and Staffa, *Dr. Greville*. Ardrossan, *Rev. D. Landsborough*. Larne, *Mr. Templeton*. Bantry Bay, *Miss Hutchins*. Howth and Balbriggan, *Miss Gower*. Kingstown, *Mr. T. N. Cole*.

GEOGR. DISTR. Atlantic shores of Europe, from Norway to France.

DESCR. *Root* consisting of thick, branching, and clasping fibres. *Stem*, an inch or two in length, slender, cylindrical below, becoming compressed upwards, and gradually widening into the much attenuated base of a linear lanceolate frond. *Frond* from six or eight inches "to three or more feet in length, and one to six inches in width," (*Grev.*) delicately membranaceous, flat, or slightly waved at the margin, undivided, tapering much, and gradually to each extremity. *Fructification*, I have not seen. *Substance* thin, but tough, glossy, and more or less perfectly adhering to paper. The frond is traversed internally by a double stratum of large air-cells, whose walls, as well as the surfaces of the frond, are composed of minute cellules. *Colour*, when quite fresh, a clear, brown-olive, soon changing in fresh water to green, which is also the colour of dried specimens.

This plant has been observed by botanists from a very early period, and almost invariably kept distinct from *L. saccharina*,

its nearest ally, by every author who has written on the subject of Phycology. Dr. Greville, who at one time united it with *L. saccharina*, has, in his last work, restored it to a place in the system, remarking:—"I cannot but express some doubt regarding the claim of this beautiful Alga to be considered as distinct from the preceding species (*L. saccharina*). The more I have studied it in a growing state, the less am I tempted to speak positively on the subject. Upon the whole, however, I am rather inclined to think it a true species. Having traced it from its earliest appearance to its full size, I can testify that its characters are preserved in every stage." I believe that most observers have, at one time or other, shared in the doubts thus expressed by Dr. Greville, and many may be disposed to go further and reject *L. phyllitis* from the list altogether. Among these I must mention Mrs. Griffiths, who has repeatedly stated to me her opinion that no good marks exist between *L. phyllitis* and *saccharina*, but that the former is merely the young of the latter. In adopting a contrary view, I have not acted hastily or without comparing specimens of the young of both plants. Very recently my friend Mr. Cole has laid before me a series of specimens of both, tracing the growth of *L. saccharina* upwards, from the height of half an inch to a full development, and a similar set of young plants of *L. phyllitis*. And I must admit that, though there is a close resemblance, there is a clear distinction at all ages between living plants: *L. saccharina* being thicker, of darker colour, and with a more abrupt base than *L. phyllitis*, whose delicately membranous nature, and strictly lanceolate form, are preserved to a very large size. The latter also very rapidly changes colour in fresh water, while the former may be preserved for some hours in that medium.

Having said so much, I submit the matter to the investigation of my fellow-students, and shall be glad to be favoured with an expression of their opinions.

Fig. 1. LAMINARIA PHYLLITIS; small specimens:—*of the natural size*. 2. Portion of the surface. 3. Section of the frond:—*both highly magnified*.



PLATE XLV.

LAMINARIA FASCIA, *Ag.*

GEN. CHAR. *Frond* stipitate, coriaceous or membranaceous, flat, undivided or irregularly cleft, ribless. *Fructification*; cloudy spots of spores, imbedded in the thickened substance of some part of the frond. LAMINARIA (*Lamour.*)—from *lamina*, a thin plate, in allusion to the flat frond.

LAMINARIA *fascia*, *Ag.*; stem very short, setaceous, gradually expanding into a membranaceous, broadly-oblong, wedge-shaped, lanceolate, or linear frond.

LAMINARIA *fascia*, *Ag. Syn.* p. xix. *Ag. Sp. Alg.* vol. i. p. 122. *Syst.* p. 273. *Wyatt. Alg. Danm.* no. 157. *Harv. Man.* p. 25. *E. Bot. Suppl.* t. 2845. *Hook. fil. Fl. Ant. ined.* *Endl. 3rd Suppl.* p. 27.

LAMINARIA *debilis*, *Ag. Spec.* vol. i. p. 120. *Syst.* p. 273. *Grev. Crypt.* t. 277. *Grev. Alg. Brit.* p. 35. t. v. *Hook. Br. Fl.* vol. ii. p. 272. *Harv. Man.* p. 25. *Endl. 3rd Suppl.* p. 27.

LAMINARIA *cuneata*, *Suhr.*

LAMINARIA *papyrina*, *Bory. in Dict. Class d'Hist. Nat.* vol ix. p. 189.

FUCUS *fascia*, *Fl. Dan.* t. 768. *Turn. Syn.* vol. i. p. 186. *Roth. Cat. Bot.* vol. ii. p. 161.

HAB. On sand-covered submarine rocks and stones in the sea, near low-water mark. Annual. Summer. North of Ireland, *Mr. R. Brown*, (*Turner*). Carrickfergus, *Mr. Templeton*. Western Islands of Scotland, *Mr. Chalmers*. Larne, *Dr. Drummond*. Antrim coast, *Mr. D. Moore*. Sidmouth and Torquay, *Mrs. Griffiths*. Mounts Bay and Salcombe, *Mr. Ralfs*. Malahide, *Mr. Mc'Calla*. Saltcoats, *Rev. D. Landsborough*.

GEOGR. DISTR. Atlantic shores of Europe from Norway to Spain. Mediterranean Sea, *C. Agardh*. Falkland Islands, *Lyall*.

DESCR. *Root* a small disc. *Stem* as thick as hog's bristle, one to four lines in length, cylindrical at the base, compressed in its upper half, and gradually widening into the cuneate base of the frond. *Frond* very variable in form, two to twelve inches long, and from a quarter of an inch to an inch and a half, or two inches, in breadth, sometimes abruptly cuneate at base, sometimes much attenuated, either lanceolate, oblong or linear, or oblong-ovate; in some cases remarkably obtuse, in others tapering to a more or less acute point, or rarely somewhat lobed at the apex, waved or flat at the margin, membranaceous, smooth, rather glossy. *Colour* varying from a greenish to a brownish olive, sometimes bright, sometimes very dingy. *Fruit* unknown. *Cellules* of the interior of the frond narrow-oblong, twelve-sided, pellucid; those of the surface very minute, arranged in areoli, four cellules in each areolus.

The first notice of this species occurs in the '*Flora Danica*,'

in which work a figure is given which coincides in most characters with the narrower and browner of our figures, and on which is grounded the *idea* of the *Laminaria fascia* of Agardh, and succeeding authors. In Greville's '*Scottish Crypt. Flora*' another figure, resembling our broadest form, is represented under the name of *Laminaria debilis*, a name first proposed by Agardh for specimens sent to him from the coast of Spain. At first sight these forms appear to be abundantly distinct, the long strap-shape of one contrasting with the broadly ovate form of the other. But the slight importance to be attached to such variations becomes at once evident to any observer who collects the plant in any quantity, on its native rock, and to whom specimens ranging from the broadest to the narrowest, occur in the same locality. From a very extensive suite of specimens from several parts of the coast, and of all shapes and sizes I have selected a few for illustration, in which a gradation of form is well shewn from the broad, abruptly stipitate *L. debilis* to the ribbon-like *L. fascia*. In uniting these under one specific head, I, of course, preserve the trivial name which was first proposed.

Specimens gathered at the Falkland Islands, by Dr. Lyall, are identical with some of the British varieties; and with the *L. cuneata*, of Suhr, which is obviously a transition plant, having a broadish frond, with a long cuneate base.

Fig. 1. LAMINARIA FASCIA, different varieties:—*natural size*. 2. Part of the frond:—*magnified*, to shew the surface cellules. 3. Section of the same, showing the internal structure.

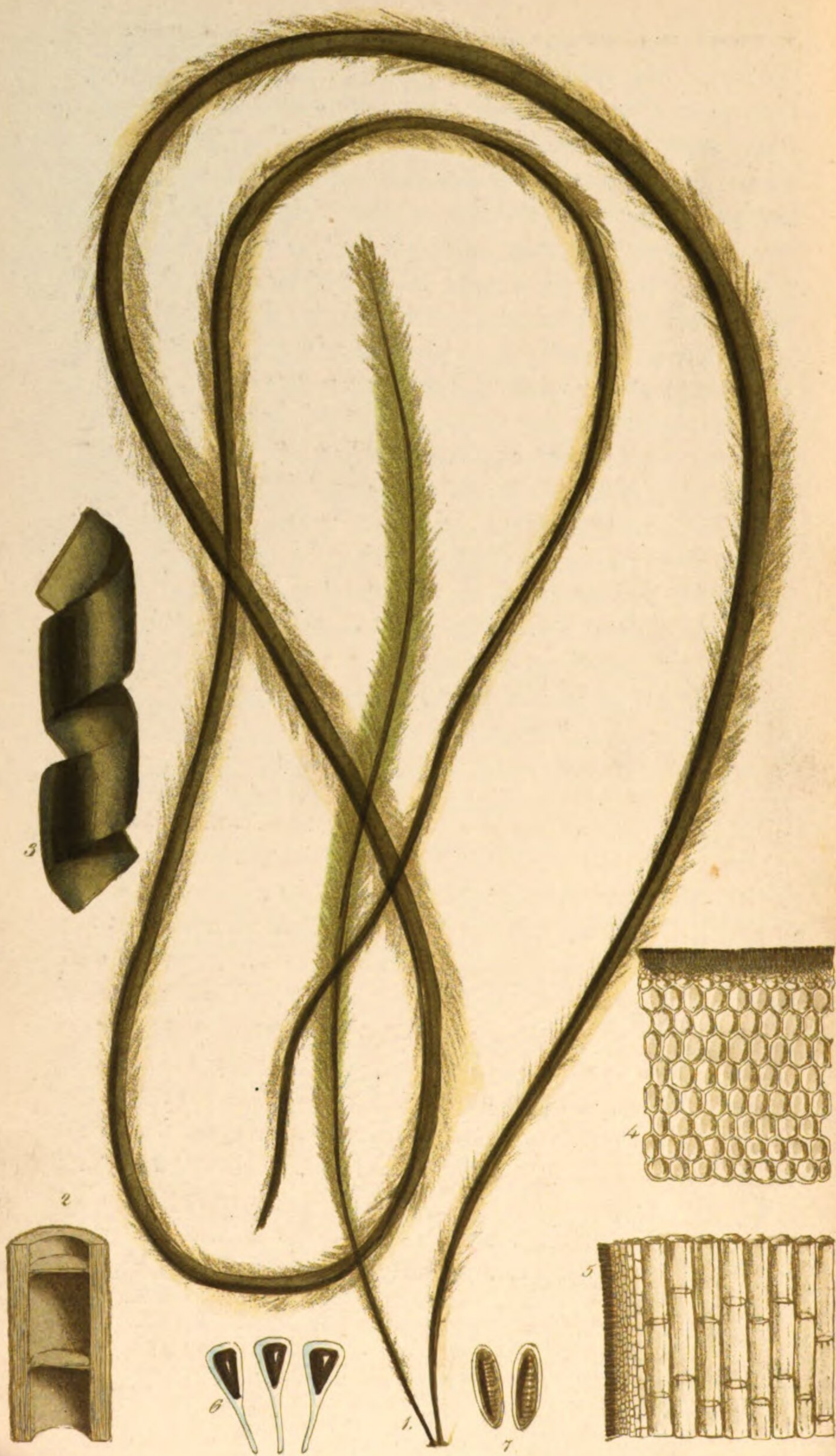


PLATE CVII.

CHORDA FILUM, *Lamour.*

GEN. CHAR. *Root* scutate. *Fron*d simple, cylindrical, tubular; its cavity divided by transverse, membranous septa, into separate chambers. *Fructification*; a stratum of obconical spores, much attenuated at the base, covering the whole external surface of the frond. Among these are found elliptical *antheridia* (?). CHORDA (*Stack.*)—a cord.

CHORDA *filum*; frond cartilaginous, lubricous, clothed with pellucid hairs, filiform, very long, tapering to each extremity, not constricted at the dissepiments.

CHORDA *filum*, *Lamour. Ess.* p. 26. *Lyngb. Hyd. Dan.* p. 72. t. 18. *Hook. in Fl. Lond. N.S.* t. 204. *Grev. Alg. Brit.* p. 47. t. 7. *Hook. Br. Fl.* vol. ii. p. 276. *Harv. in Mack. Fl. Hib.* part 3. p. 174. *Harv. Man.* p. 36. *Wyatt, Alg. Danm.* no. 159. *Kütz. Phyc. Gen.* p. 334. t. 29.

CHORDARIA *filum*, *Ag. Syn.* p. 13. *Hook. Fl. Scot.* part 2. p. 98.

SCYTOSIPHON *filum*, *Ag. Sp. Alg.* vol. i. p. 161. *Ag. Syst.* p. 257. *Grev. Fl. Edin.* p. 288. *Spreng. Syst. Veg.* vol. iv. p. 328. *Endl. 3rd Suppl.* p. 25.

FUCUS *filum*, *Linn. Sp. Pl.* p. 1631. *Stack. Ner. Brit.* t. 10. *Turn. Hist.* t. 86. *Eng. Bot.* t. 2487.

FUCUS *tendo*, *Esper, Ic.* t. 22.

CERAMIUM *filum*, *Roth, Cat. Bot.* vol. i. p. 147.

Var. β . *tomentosa*; of small size, more densely clothed with coloured, olive or green hairs.

CHORDA *tomentosa*, *Lyngb. Hyd. Dan.* p. 74. t. 19.

HAB. On rocks and stones in the sea, commencing within tide marks, and extending in still water to the depth of ten or fifteen fathoms. Annual. Summer and Autumn. Very abundant on the shores of the British Islands.

GEOGR. DISTR. Abundant throughout the North Atlantic, on the shores of Europe and America. Coast of Brazil. Also in the North Pacific, at Sitka, Unalaschka and Kamtschatka.

DESCR. *Root*, a minute disc. *Fron*ds tufted, one to twenty, or in still water even forty feet in length, scarcely twice as thick as a bristle at the base, gradually increasing in thickness to the middle, and there from a quarter to half an inch in diameter, and again gradually diminishing toward the apex, which is of equal tenuity with the base, cylindrical, hollow, divided at short intervals, by very thin membranes, into chambers or joints, which are not visible externally, very lubricous or slimy, clothed at an early stage with very dense, slender, gelatinous filaments, which generally disappear as the plant advances to maturity, but may sometimes be found on old plants. *Substance* cartilaginous and firm, very tough when recent. *Fructification* covering the whole surface of old plants, consisting of obconical, vertical spores, supported on long pedicels, by which they are fixed to the outer

stratum of cellular tissue. Mixed with these are found numerous narrow, elliptical, transversely striate bodies, which may be antheridia. The walls of the frond are formed of several rows of hexagonal jointed longitudinal filaments, combined together: the inner of which are of large size, with long joints, the outer very minute and densely packed together.

Few persons can visit the coast without becoming familiar with this common plant, which is to be found in greater or less perfection on all our shores. But it is in quiet land-locked bays, with a sandy or somewhat muddy bottom, and in from three to six fathoms water that it reaches its greatest size. In such places it frequently forms extensive submarine meadows, so dense as seriously to affect the passage of boats, and to endanger the life of the unfortunate swimmer who may chance to become entangled in its slimy cords, which when growing have considerable tenacity. The smaller variety, which is by some authors considered a distinct species, occurs between tide marks. Were it of uniform size, and always distinguished by a denser and brighter coloured covering of filaments, its rank might, perhaps, be acknowledged; but I have found it impossible to fix its limit in either character. It is connected by insensible gradations with the common form. Some of the most distinct looking individuals of this variety which I have seen, I owe to the kindness of Mr. Ralfs, who procured them at Penzance.

The fructification of this plant is more like that of the *Laminariæ* than of any *Dictyotæ*, with the exception of the Antarctic genus *Adenocystis*, which differs from *Chorda* more by habit than any carpic character. Through *C. Lomentaria*, if that plant really be a congener, there is a connection with *Asperococcus*, and so with the other *Dictyotæ*. Still I am inclined to think, notwithstanding the different habit, that the present plant is properly a member of the *Laminaria* group, in affinity as well as in habitat. What I have called *antheridia*, which I find abundantly mixed with the true spores, are perhaps what were first observed by the late Capt. Carmichael, and are figured from his sketch in the 'Flora Londinensis.'

Fig. 1. CHORDA FILUM, both varieties, young plants:—of the natural size.
2. A longitudinal semi-section of the frond. 3. The frond unrolled.
4. Transverse section of the wall of the frond. 5. Longitudinal section of the same. 6. Spores. 7. Antheridia (?):—all more or less magnified.

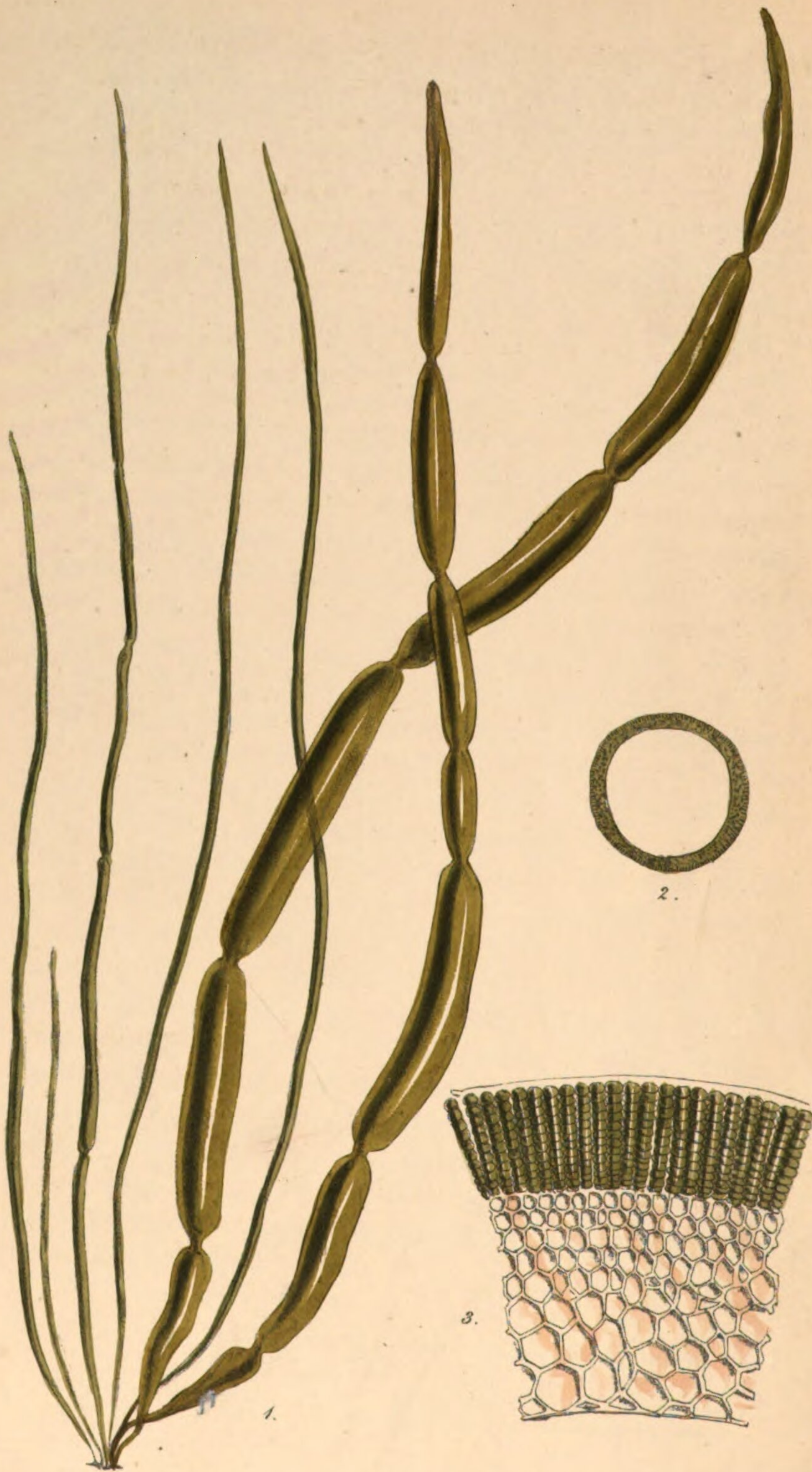


PLATE CCLXXXV.

CHORDA LOMENTARIA, *Lyngb.*

GEN. CHAR. *Root* scutate. *Frond* simple, cylindrical, tubular; its cavity divided by transverse membranous septa, into separate chambers. *Fructification*, a stratum of obconical *spores* much attenuated at the base, covering the whole external surface of the frond. Among these are found elliptical *antheridia*. CHORDA (*Stack.*),—a cord.

CHORDA *lomentaria*; frond membranaceous, constricted at distant intervals, the interstices inflated.

CHORDA *lomentaria*, *Lyngb. Hyd. Dan.* p. 74. t. 18. *Grev. Alg. Brit.* p. 48. *Hook. Brit. Fl.* vol. ii. p. 276. *Harv. in Mack. Fl. Hib.* part 3. p. 174. *Harv. Man.* p. 35. ed. 2. p. 32. *Wyatt, Alg. Danm.* no. 6. *E. Bot. Suppl.* t. 2902. *J. Ag. Alg. Medit.* p. 45.

CHORDA *fistulosa*, *Zanard. Syn. Alg. Adr.* p. 87.

SCYTOSIPHON *lomentaria*, *Endl. 3rd Suppl.* p. 25. *J. Ag. Spec. Alg.* vol. i. p. 126.

SCYTOSIPHON *filum*, var. γ , *Ag. Spec. Alg.* vol. i. p. 162. *Ag. Syst.* p. 257.

SOLENIA *fuscata*, *Bory, Morée*, no. 1485.

ASPEROCOCCUS *castaneus*, *Carm. Hook. Br. Fl.* vol. ii. p. 277.

CHLOROSIPHON *Shuttleworthianus*, *Kütz. Phyc. Gen.* p. 301.

HAB. On rocks, stones, and the smaller Algæ, in tide-pools. Annual. Summer and autumn. Abundant on the shores of the British Islands.

GEOGR. DISTR. Atlantic shores of Europe from Norway to Spain. Mediterranean Sea. Shores of North and South America. Japan. Southern and Antarctic Oceans.

DESCR. *Root* a minute, naked disc. *Fronde*s from eight to twelve or eighteen inches in length, tapering at the base to the diameter of horse-hair, attenuated upwards, either to a bluntish or a very fine point, from two to four lines in diameter at the greatest breadth, cylindrical, constricted at irregular intervals and furnished with a transverse septum at each constriction. The walls of the tube are composed of a thick layer of large, polygonal cells, of which the outer ones are gradually smaller; on the outside of which, forming the periphery, is a stratum of radiating, close-packed, moniliform filaments. These are only found in their full development in mature specimens. *Colour* a brownish or greenish olive. *Substance* membranaceous and soft, adhering closely to paper in drying.

A common plant, of little beauty, widely dispersed through the temperate oceans of both hemispheres. In a young state no septa are visible externally, the frond being filiform. In this

condition it is sometimes a little difficult to distinguish specimens of *Chorda lomentaria*, from narrow ones of *Asperococcus echinatus*, except by their more chestnut colour and more polished surface, and Capt. Carmichael has described such individuals under the name of *A. castaneus*.

Authentic specimens of Kützing's *Chlorosiphon Shuttleworthianus*, obligingly communicated to me by that author, appear to me to belong to the very youngest state of the present plant. They were collected by Mr. Shuttleworth in the West of Ireland, where our *Chorda* is abundant.

Fig. 1. Fronds of CHORDA LOMENTARIA, of various ages;—the natural size.
2. Transverse section of the frond. 3. Small portion of the same :—more highly magnified.

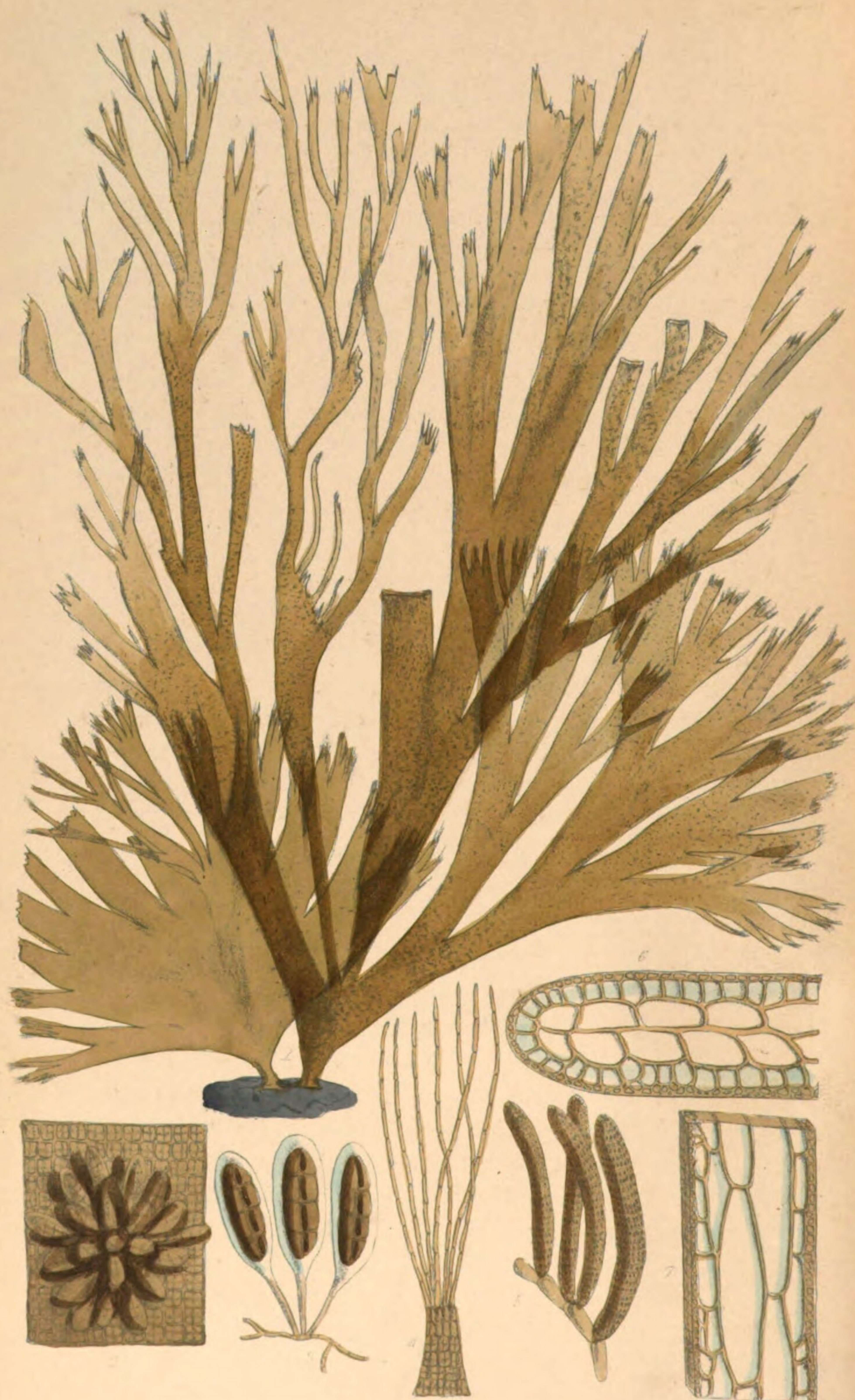


PLATE LXXV.

CUTLERIA MULTIFIDA, Grev.

GEN. CHAR. *Root* clothed with woolly fibres. *Frond* flat or compressed, cartilagineo-membranaceous, ribless, somewhat fan-shaped, irregularly cleft or dichotomous. *Fructification*, dot-like tufts of pedicellate *utricles*, scattered over both surfaces of the frond; each utricle containing several *spores*. *Antheridia* on distinct plants, linear, transversely dotted, sessile on the sides of minute tufted filaments, occupying the position of true sori. CUTLERIA (Grev.),—in honour of Miss Cutler, of Sidmouth, a distinguished British Algologist.

CUTLERIA *multifida*; frond thickish, polymorphous, flabelliform, irregularly cleft into numerous narrow laciniae; axils very acute; apices attenuated, pencilled.

CUTLERIA *multifida*, Grev. *Alg. Brit.* p. 60. t. 10. *Hook. Br. Fl.* vol. ii. p. 281. *Wyatt. Alg. Danm.* n. 61. *Harv. in Mack. Fl. Hib.* pt. 3. p. 177. *Harv. Man.* p. 29. *J. Ag. Alg. Medit.* p. 40. *Menegh. Alg. Ital. et Dalm.* p. 201. *Endl. 3rd Suppl.* p. 25. *Kütz. Phyc. Gen.* p. 339. *Dickie, Ann. Nat. Hist.* v. 14. p. 168.

ZONARIA *multifida*, *Ag. Sp.* vol. i. p. 135. *Syst.* p. 267.

DICTYOTA *penicillata*, *Lamour. in Desv. Journ. Bot.* vol. ii. p. 41. *Lamour. Ess.* p. 58. *Ag. Sp. Alg.* vol. i. p. 139.

DICTYOTA *multifida*, *Bory, Morée*, p. 75. no. 1756

SPOROCHNUS *multifidus*, *Spreng. Syst. Veg.* vol. iv. p. 329.

ULVA *multifida*, *Sm. Eng. Bot.* t. 1913.

HAB. On rocks and shells in the sea, in 4–15 fathoms water. Annual. Summer and autumn. Rare. Yarmouth, *Mr. Turner* and *Mr. Wigg*. Seaton and Torquay, *Mrs. Griffiths*. Sidmouth, *Miss Cutler*. Brighton, *Mr. Borrer*. Plymouth, *Rev. W. S. Hore*. Bantry Bay, *Miss Hutchins*. Ballycotton, *Miss Ball*. Kilkee and Wicklow, *W. H. H.* Roundstone Bay, *Mr. Mc' Calla*. Not found in Scotland?

GEOGR. DISTR. Coasts of England and Ireland. Atlantic shores of France and Spain. Mediterranean Sea.

DESCR. *Root* an expansion, densely coated with woolly, jointed, branching fibres. *Frond* from two to twenty inches in length, having a broadly wedge-shaped or fan-shaped general outline, but very variable in its minor divisions. The base is always broadly wedge-shaped, tapering into a short stem from a quarter to half an inch in length. The frond expands upwards, and is then often cleft into numerous wedge-shaped lobes, each of which is repeatedly and very irregularly incised from the apex downwards, the ultimate laciniae being gradually narrower, and the apices acute. In some specimens the whole frond is cleft nearly to its base into narrow, irregularly dichotomous ribbons, from half a line to a line in breadth; in others the laciniae are from half an inch to an inch broad, and do not extend below the middle of the frond. In some the apices are regularly fastigate, and the outline nearly circular; in others they are of very various length. When in a perfect state the apices terminate in pencils of delicate jointed filaments (fig. 4), and a net-work of similar, but branching, filaments extends over the whole surface

of the frond, closely investing it; and to this net-work the fructification is attached. *Fructification*, of two kinds, on distinct individuals; 1, pedicellate, oblong *utricles*, each containing about eight spores, clustered in minute tufts, which are plentifully dispersed over both surfaces of the frond, appearing like dots to the naked eye. 2, sausage-shaped or linear, obtuse *antheridia* (?) attached to tufted filaments and scattered, like the utricles, over the whole frond. They are densely zoned with dotted lines. *Substance* cartilaginous, at first crisp, but becoming flaccid; and then, on pressure, closely adhering to paper in drying. *Colour* a foxy olive. *Structure* very lax, the cells of the interior being few, of great size, and colourless.

Cutleria multifida was discovered at Yarmouth by Mr. Dawson Turner, in August, 1804, and first described in English botany by Sir J. E. Smith. Although found on many parts of our coasts it is still considered a rare species, partly, perhaps, from its place of growth being beyond the limit of ordinary tides. Occasionally, after stormy weather, it is washed up in some plenty. The most abundant habitat yet discovered, is at Roundstone Bay, where, last summer, Mr. Mc' Calla dredged a large quantity in a remarkably fine state.

This beautiful plant was selected by Dr. Greville to commemorate the services rendered to British Botany by Miss Cutler, of Sidmouth, whose explorations of her neighbourhood have amply earned "the highest compliment that one botanist can bestow on another." No genus can be more distinct, and few, among the *Dictyoteæ*, have a more delicate or curious structure. The fruit is very remarkable. The *antheridia*, described by Dr. Dickie in the 'Annals of Natural History', I have only observed on a specimen sent me by Miss Cutler many years since, but similar bodies appear to be commonly borne by the exotic *C. adspersa*, on my specimens of which species I can find no other fruit. They bear a striking resemblance to the silicular fruit of *Ectocarpus*, and perhaps are organs of a similar nature.

Four species of *Cutleria* are described, with three of which only am I acquainted. Our *C. multifida* is found on all the coasts of southern Europe; *C. laciniata* (which I only know by name), on the French coasts; and *C. adspersa* and *pardalis* in the Mediterranean. The two latter are very like each other, if they be really more than varieties of one species, but both are abundantly distinct from *C. multifida*, though evidently belonging to the same natural genus.

Fig. 1. CUTLERIA MULTIFIDA :—*natural size*. 2. A *sorus* of utricles attached to a fragment of the frond. 3. Utricles, separated. 4. Apex of a lacinia. 5. Antheridia. 6. Transverse section of the frond. 7. Longitudinal section :—*all more or less highly magnified*.

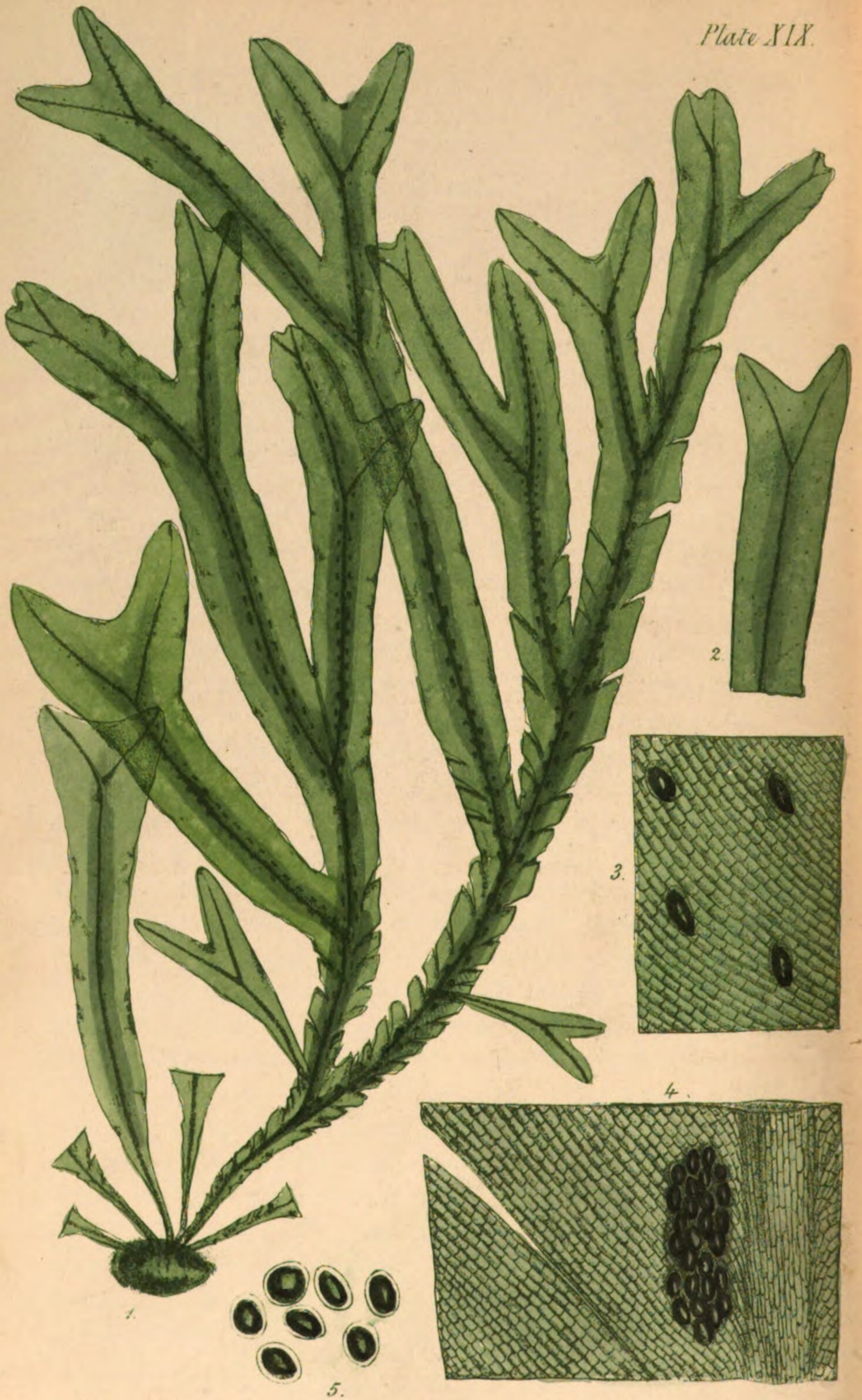


PLATE XIX.

HALISERIS POLYPODIOIDES, Ag.

GEN. CHAR. *Root*, a mass of woolly filaments. *Frond* flat, linear, membranaceous, with a mid-rib. *Fructification*: ovate spores, forming distinct sori, or groups, mostly arranged in longitudinal lines. *Grev.* HALISERIS—from ἅλς, the sea, and σέρις, endive.

HALISERIS *polypodioides*; frond dichotomous, entire at the margin, plane; spots of fructification linear, disposed along the mid-rib.

HALISERIS *polypodioides*, Ag. *Sp. Alg.* vol. i. p. 142. *Syst.* p. 262. *Spreng. Syst. Veg.* vol. iv. p. 328. *Grev. Alg. Brit.* p. 64. t. 8. *Hook. Br. Fl.* vol. ii. p. 283. *Mack, Fl. Hib.* part 3. p. 178. *Wyatt, Alg. Danm.* no. 12. *Harv. Man.* p. 30. *Kütz. Phyc. Gen.* p. 340. t. 23. *Mont. Pl. Cell. Canar.* p. 148.

DICTYOPTERIS *polypodioides*, Lamx. *Journ. Bot.* p. 19. sec. Ag.

DICTYOPTERIS *elongata*, Lamx. *l. c.* p. 18. sec. Ag.

FUCUS *polypodioides*, Desf. *Fl. Atl.* vol. ii. p. 421. *Lamx. Dict.* p. 32. t. 24. f. 1.

FUCUS *membranaceus*, Stack. *Ner. Brit.* p. 13. t. 6. *Turn. Syn. Fuc.* vol. i. p. 141. *With.* vol. iv. p. 93. *E. Bot.* t. 1758. *Turn. Hist.* t. 87.

FUCUS *ambiguus*, Clem. *Ess.* p. 310.

ULVA *polypodioides*, Dec. *Fl. Fran.* vol. xi. p. 15.

HAB. On rocks and stones in the sea, from two to five fathoms. Perennial. Summer and Autumn. Rare. Several places along the southern shores of England, where Mr. Stackhouse first gathered it. Shields, Mr. Winch. Miltown Malbay, W.H.H. (1831). Youghal, Miss Ball. Roundstone Bay, Mr. Mc'Calla. Jersey, Miss White; Miss Turner.

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe. North of Africa, Desf. Ceylon, Herb. Linn. South Africa, Ecklon. Bahia, Martius. Canary Islands, very rare, Despreaux.

DESCR. *Root* a callous disc, densely covered over with finely divided, tough, matted fibres. *Fronde*s growing in tufts, 4–12 inches high, about half an inch wide, linear, several times dichotomous, the axils patent, traversed by a dark coloured, filiform mid-rib, which is very strong below, and becomes gradually thinner upwards. The apices of the segments are obtuse or emarginate, in which case the tip of the mid-rib is forked. The margin is flat, and entire. The membrane of the frond is rather rigid, thin, and tears with great facility in an oblique direction from the margin to the mid-rib, and the lower parts of full grown fronds are very generally much lacerated. Not unfrequently proliferous shoots are produced, especially from old, weather-beaten plants, at points along the mid-rib. *Fructification* of two kinds has been observed, on distinct individuals. The first and regular kind consists in oblong sori or groups of elliptical spores lying close at either side of the mid-rib; the second in scattered single spores (?) of larger size than the former, dispersed over the frond. *Colour*, a clear olive-green, with a tinge of yellow; becoming foxy in age, and darker in a dry state. *Smell* when freshly gathered, strong and disagreeably pungent.

The subject of the present plate, though in some degree known to Linnæus, who confounded it with *Fucus distichus*, was first clearly described by Desfontaines in 1798, under the name of *Fucus polypodioides*; and in 1801 figured by Mr. Stackhouse in the first number of his "Nereis Britannica," under that of *Fucus membranaceus*. The former appellation, which alludes to the resemblance which its fructification bears to that of a Polypodium has been generally adopted. As may be seen by the number of stations on record, this plant is widely distributed over the warm parts of the world. In the British Islands it is decidedly rare, and chiefly found on the southern and western shores. It does not appear to be found in Scotland. In the south of Europe it is common, especially in the Mediterranean, and has been brought from the tropics of either hemisphere. I have not seen Cape specimens, but Ecklon is reported to have gathered it in Algoa Bay.

Mrs. Griffiths, who first discovered the scattered spores, finds occasionally specimens in which the frond is marked, in the place usually occupied by the *sori*, with brown, wavy, map-like lines enclosing spaces which are usually more transparent than the rest of the frond. They probably indicate a diseased state of the fruit-producing cells.

Several other species of *Haliseris* are now known, all natives of warm latitudes, and all with much the same habit. Some have thick, almost coriaceous fronds; and others are much more tender and delicate than the European species; some have serrated, and others crisped margins; but the mode of branching is similar in all.

Fig. 1. HALISERIS POLYPODIOIDES, with sori. 2. A segment, with scattered spores:—*natural size*. 3. Portion of a frond with scattered spores. 4. Portion of a frond with a sorus. 5. Spores from the sorus:—*all more or less highly magnified*.

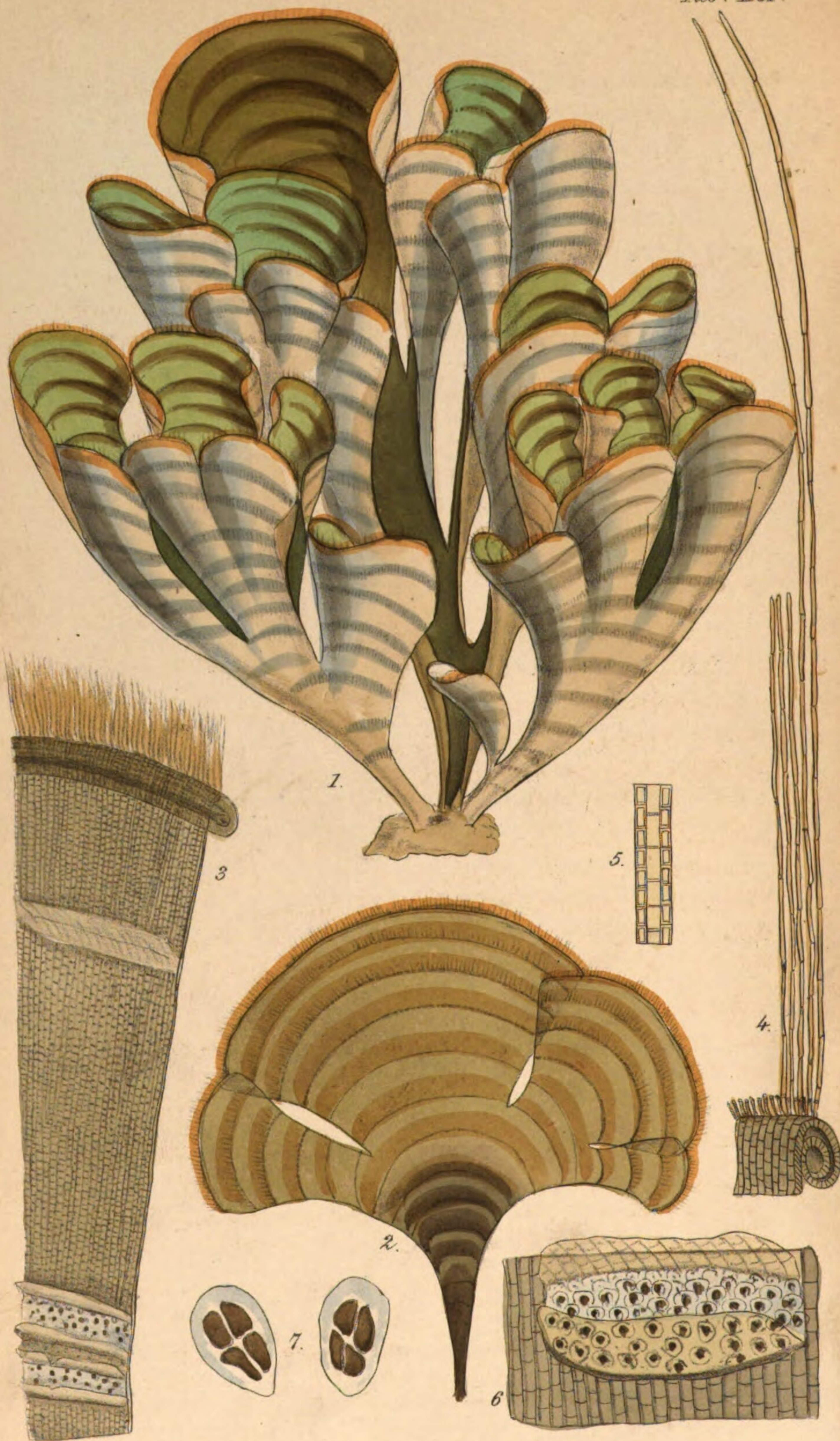


PLATE XCI.

PADINA PAVONIA, *Lamour.*

GEN. CHAR. *Root* coated with woolly fibres. *Fronde* flat, ribless, fan-shaped, marked at regular distances with concentric lines, fringed with articulated filaments; apex involute. *Fructification*, linear, concentric sori, bursting through the epidermis of the frond, containing at maturity, numerous obovate utricles or tetraspores, fixed by their base, and containing four sporules. PADINA—a name invented by Adanson, who has not explained the meaning.

PADINA *Pavonia*; frond between membranaceous and coriaceous, broadly fan-shaped, entire or deeply cleft, powdery on its outer surface; concentric lines numerous.

PADINA *Pavonia*, *Lamour. Dict. Class. d'Hist. Nat.* vol. 12. p. 589. *Gaill. Dict. Hist. Nat.* vol. 53. p. 371. *Grev. Alg. Brit.* p. 62. t. x. *Hook. Br. Fl.* vol. ii. p. 281. *Harv. Man.* p. 30. *Wyatt, Alg. Danm.* no. 11. *J. Ag. Alg. Medit.* p. 39. *Endl. 3rd Suppl.* p. 25. *Menegh. Alg. Ital. and Dalm.* p. 239. *Montg. Hist. Cuba*, p. 67. *Cell. Canar.* p. 145. *Alger.* p. 33.

PADINA *Mediterranea*, *Bory, Morée*, p. 75. *Montag. Crypt. Alg.* n. 79.

DICTYOTA *Pavonia*, *Lamour. Ess.* p. 57.

ZONARIA *Pavonia*, *Ag. Sp. Alg.* vol. i. p. 125. *Ag. Syst.* p. 263. *Spreng. Syst. Veg.* vol. iv. p. 326. *Kütz. Phyc. Gen.* p. 341. t. 22. f. 1.

ULVA *Pavonia*, *Linn. Syst. Nat.* p. 719. *Esper. App.* t. 4. *E. Bot.* t. 1276. *Derf. Fl. Atlant.* vol. ii. p. 428. *Roth. Cat.* vol. ii. p. 240. vol. iii. p. 322.

ULVA *cucullata*, *Cav. Ic.* vol. ii. p. 73. t. 191. f. 2. E.

FUCUS *Pavonius*, *Linn. Sp. Pl.* vol. ii. p. 1630. *Wulf. Crypt. Ag.* p. 33.

HAB. On rocks in shallow pools, at half-tide level. Annual. Summer and autumn. Several places along the southern coasts of England; abundant at Torquay. Jersey, *Miss White* and *Miss Turner*.

GEOGR. DISTR. Atlantic shores of France and Spain. Very abundant in the Mediterranean. Tropical, Atlantic, and Indian Oceans.

DESCR. *Root*, an expansion, densely coated and cushioned with woolly filaments. *Fronde*s tufted, two to five inches in height, cuneate and attenuate at the base, broadly fan-shaped upwards, simple, or cleft from the summit into several lobes, which as they increase in size, gradually acquire a fan-shaped outline, the apical margin being circularly curved. The whole frond of young plants, and the several lobes of those further advanced, are, when growing, curled round into funnel-shaped cups. At distances of one to two lines the frond is marked with concentric bands, along each of which a fringe of orange-coloured articulated filaments, of extreme tenuity, and about two lines in length, extends. These, which originally have clothed every band or zone, are seldom found perfect, except on the two or three uppermost, and on the marginal one; falling away as the frond advances. The margin at the summit of the frond is strongly rolled inwards; the outer or lower surface, is covered, more or less perfectly, with a white, chalky powder; the inner, except for the fringes of filaments, is smooth, and of a yellowish olive, reddish towards the base, and greenish toward the apex. *Substance* thickish, subcoriaceous below, delicately membranous

above, highly reticulated. *Fructification*, linear lines of dark coloured spores, formed beneath the epidermis, along the concentric zones, at length bursting through the coating of the frond, which forms a permanent indusium to them. At maturity the spores contain four sporules.

A very remarkable plant, abundant in the Tropical Ocean, and reaching its northern limit on the southern shores of England, without exhibiting any depauperation from climate. The British specimens are fully as large as those from warmer latitudes, and as well coloured. This being the case, one would naturally expect that it may yet be discovered further north. There is indeed a tradition, resting on the authority of Dr. Cargill, quoted by Lightfoot, that it was once gathered at Aberdeen, but it has not been found in Scotland in modern times, and I fear there has been a mistake: yet it is difficult to imagine what could have been mistaken for it, so different in appearance is it from all other Algæ.

Probably this is the only genuine species of the genus, as now restricted; the tropical forms which have been described being mere varieties of this type. Our British *P. parvula* must be separated, and has been made the type of a peculiar genus by Areschoug; while *P. deusta*, Hook., now constitutes the genus *Ralfsia*. Several of the Grevillian species, which differ considerably in their fructification from *P. Pavonia*, now form the restricted genus *Zonaria*, J. Ag.; a very natural group, but not very happily named, for they are much less regularly zoned than the *Padina*.

So singular a species as this is could not fail to be observed at an early period, and notices of it occur in Bauhin, and other early writers. An excellent account is given by Ellis, accompanied by a figure with very correct dissections, in his celebrated work on Corallines, into which he has introduced it, not on the supposition of its animal nature, but from the elegance of its form, and singularity. Its general resemblance to the expanded tail of the Peacock, has been noticed by all authors. When viewed growing under water this resemblance is peculiarly striking, the fringes of capillary fibres which adorn it, decomposing the rays of light, and giving rainbow colours to the surface.

Fig. 1. Tuft of *PADINA PAVONIA*. 2. A frond separated and expanded:—*both of the natural size*. 3. Segment of the frond, showing involute apex; capillary fringe; and young and old sori. 4. Apex and fringe. 5. Vertical section. 6. Portion of a sorus. 7. Tetraspores:—*all more or less highly magnified*.

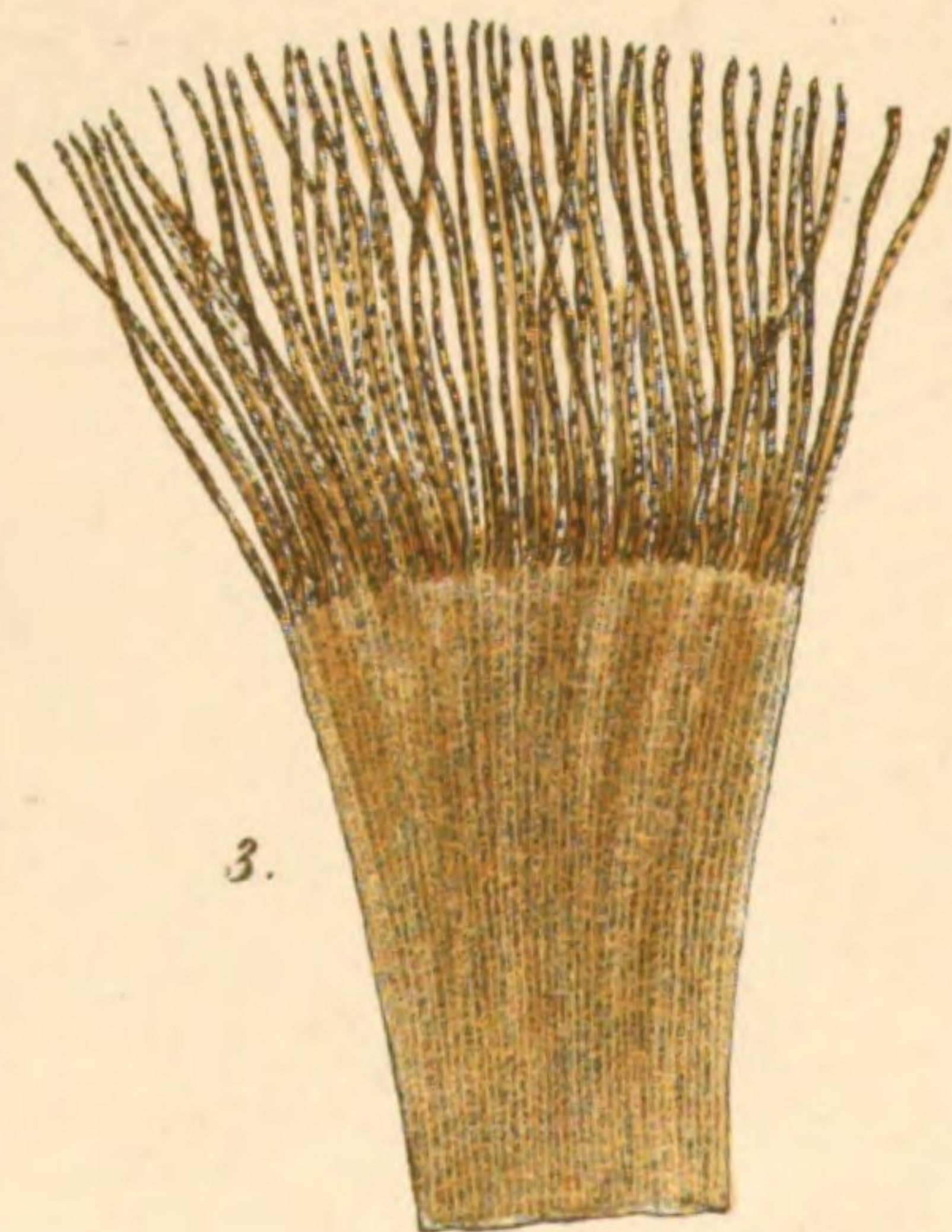


PLATE CCCLIX.

ZONARIA COLLARIS, *Ag.*

GEN. CHAR. *Root* coated with woolly fibres. *Frond* flat, ribless, fan-shaped, entire or variously cleft, marked with concentric lines; the cells of the surface radiating. *Margin* fringed. *Fructification*, roundish or irregular, scattered *sori*, bursting through the cuticle of both surfaces of the frond, consisting, at maturity, of numerous *spores* nestling among jointed threads. ZONARIA (*Ag.*),—from ζώνη, a girdle or zone.

ZONARIA *collaris*; “frond procumbent, coriaceous, orbicular, or cuneate and variously lobed, from its upper surface emitting cup-shaped, membranaceous fronds; the under surface rooting, densely stupose.” *J. Ag.*

ZONARIA *collaris*, *Ag. Sp. Alg.* vol. i. p. 127. *Ag. Syst.* p. 264. *J. Ag. Alg. Medit.* p. 38. *Endl. 3rd Suppl.* p. 25. *Kütz. Sp. Alg.* 565.

PADINA *collaris*, *Grev. Syn.* part xliv. *Menegh. Ital.* p. 245. *Mont. Alger.* p. 33.

PADINA *omphalodes*, *Mont. Crypt. Alger.* p. 15. No. 168.

ZANARDINIA *prototypus*, *Nardo.* (fide *Meneg., &c.*)

HAB. (Washed ashore.) Granville Bay, Jersey (May 1851). *Miss Turner.* (Very rare.)

GEOGR. DISTR. Mediterranean and Adriatic Seas. West Indian Sea.

DESCR. “The primary frond, when mature, is coriaceous in colour and substance, widely spreading, furnished with a dense woolly coating on its lower surface, by which it strongly adheres to rocks; the upper surface is smooth, and variously plaited longitudinally; but by the action of the waves and of animalcules is mostly very much torn and lobed. From the upper surface of this primary frond rise cup-shaped secondary fronds, fixed by a very short stipes, in the dried plant resembling an umbilicus, and with the limb fringed with filaments. The youngest of these secondary fronds are smaller than peas; the full-grown about the height of the cup-shaped fronds of *Himanthalia*; all are delicately membranaceous, entire, and easily torn. The fringe of hairs that crowns the frond is formed of the free apices of the longitudinal strings of cells of the frond. Fruit unknown.” *J. Ag.*

This most interesting addition to the Channel *Nereis*, was recently found on the shores of Jersey, by Miss Turner, to whom I am indebted for the specimens here figured, and which I rejoice to be able to include in the present work. They were “quite fresh,” Miss Turner informs me, “when picked up;

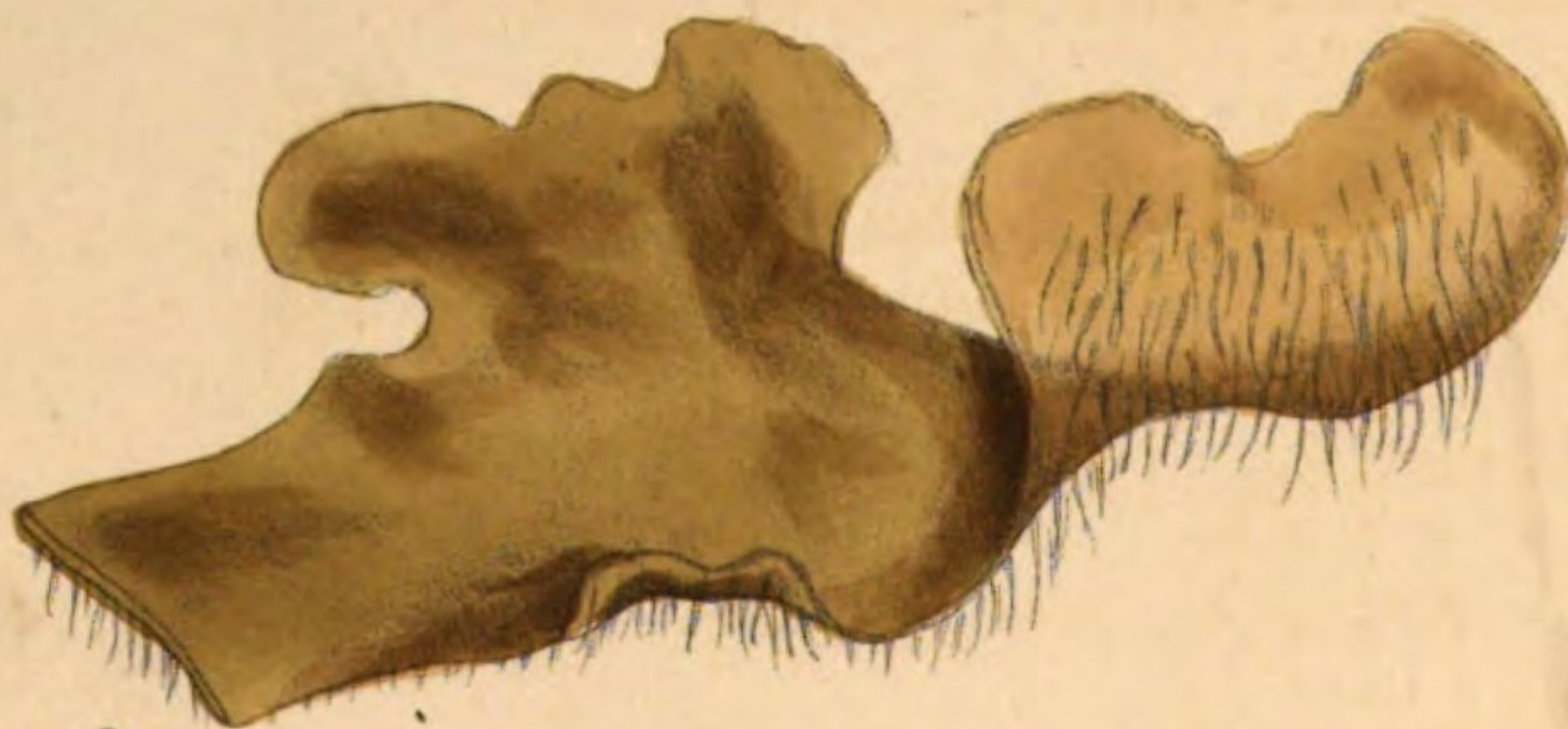
lying among other Algæ on the sand in Granville Bay; they had a saucer-like shape, which they have lost in pressing." They consist merely of the secondary fronds, accidentally torn from the firmly attached primaries, which may possibly be reached by dredging on the coast. I have compared them with specimens of the Mediterranean plant received from J. Agardh, and the agreement is very perfect. There can, therefore, be no doubt of the indentivity of the species.

Never having seen the primary frond, I give the specific character and description nearly in the words of Agardh; and our upper figure (fig. 1) is an attempted restoration of the flattened specimen, more faithfully represented at fig. 2.

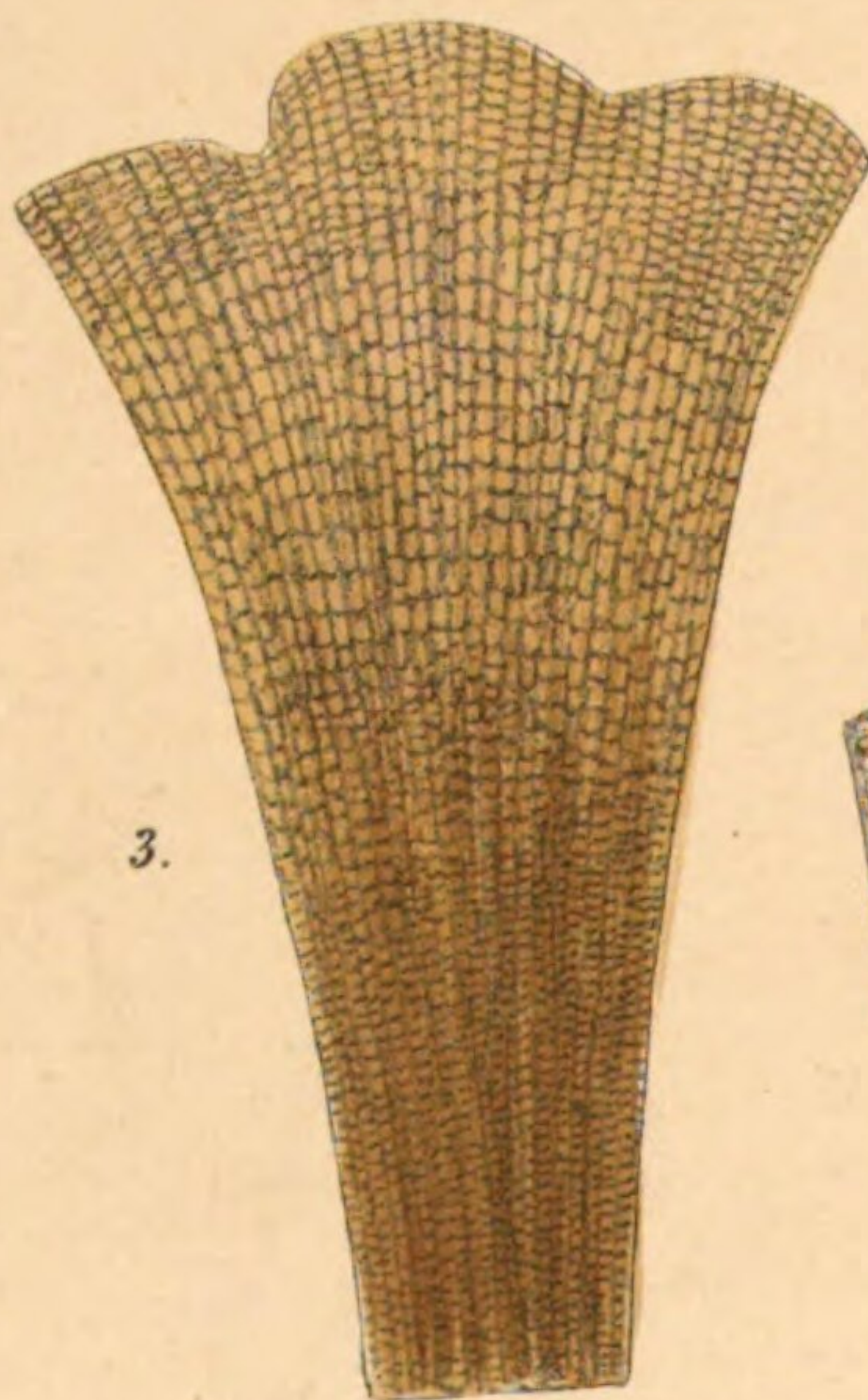
Fig. 1. ZONARIA COLLARIS:—*the natural size.* 2. One of the fronds of the same opened out:—*the natural size.* 3. Apex of frond, with its fringe. 4. Filaments from the fringe:—*both magnified.*



1.



2.



3.



4.



5.

PLATE CCCXLI.

ZONARIA PARVULA, Grev.

GEN. CHAR. *Root* coated with woolly fibres. *Fron*d flat, ribless, fan-shaped, entire or variously cleft, marked with concentric lines; the cells of the surface radiating. *Fructification*, roundish or irregular, scattered *sori*, bursting through the cuticle of both surfaces of the frond, consisting, at maturity, of numerous *spores*, nestling among jointed threads. ZONARIA (*Ag.*),—from ζώνη, a girdle or zone; because the frond is usually transversely banded.

ZONARIA *parvula*; frond procumbent, attached by fibres issuing from its lower surface, membranaceous, suborbicular, variously lobed; lobes free, rounded, scarcely marked with concentric lines.

ZONARIA *parvula*, Grev. *Crypt. Fl.* t. 360. *J. Ag. Sp. Alg.* vol. i. p. 107. *Harv. Man.* ed. 2. p. 38.

PADINA *parvula*, Grev. *Alg. Brit.* p. 63. *Hook. Br. Fl.* vol. ii. p. 282. *Harv. Man.* ed. 1. p. 31.

PADINA *reptans*, Crouan.

PADINELLA *parvula*, Aresch. *Pug.* vol. ii. p. 260. t. ix. f. 1-3.

AGLAIIOZONIA *parvula*, Zanard. *Sag.* p. 38. *Kütz. Sp. Alg.* p. 566.

AGLAIIOZONIA *reptans*, Kütz. l. c.

HAB. On stones and nullipores near low-water mark, and especially on nullipore banks in 4-15 fathoms water. Perennial? Summer. Discovered by Miss Cutler, on sandstone tidal rocks near Sidmouth. Miltown Malbay, near low-water mark; and Roundstone, on the nullipore bank, W. H. H. Bute, Rev. D. Landsborough. Probably all round the coast, in deep water.

GEOGR. DISTR. British and French Atlantic coasts. Baltic Sea. Adriatic.

DESCR. *Root*? *Fron*ds procumbent, spreading over the rocks or surface of the nullipore in circular patches, like a *lichen*, closely attached by means of numerous fibrils or rootlets which issue from all parts of the lower surface; when young roundish, and slightly lobed, the lobes rounded; as the plant advances the lobes become elongate, somewhat linear, from a quarter to half an inch in width, simple or subdichotomously divided, with rounded axils; *apices* always rounded, and broader than the inferior portion of the lobe, thus affecting a fan-shaped form. *Margin* somewhat wavy, free from the rock. *Substance* membranaceous, brittle, and not adhering to paper. *Surface* reticulated with small cells, which are arranged in slightly radiating longitudinal lines, the cells at the base of the lobe being small and close-

pressed, those above them wider and longer, quadrate and nearly twice as long as broad: again, the apical cells are always short while the frond is in a growing state, as it increases by successive additions to the outer margin. *Fibrils* simple or forked, taking hold of the rock by discs at their tips.

This is not an uncommon plant on various parts of our coast, though frequently overlooked, owing to its hiding in crevices, or creeping through the much-branched stony nullipores. When occurring on rocks near low-water mark it is broader, less branched, and of paler colour than when dredged from deeper water. I am not able to detect satisfactory characters by which to separate the *Padina reptans* of Crouan, for specimens of which I am indebted to M. Lenormand.

No one, in this country, has met with fructification, which seems only to have been found by Dr. Areschoug, in Sweden. He finds spores collected in undefined largish sori, near the base of the frond.

Fig. 1. ZONARIA PARVULA :—*the natural size*. 2. Part of a frond :—*magnified*.
3. Small portion of a lobe, to show the longitudinal, radiating lines of cells.
4. A small part of the same, with undeveloped apical cells :—*highly magnified*. 5. Fibrils :—*highly magnified*.



PLATE I.

DICTYOTA ATOMARIA, Grev.

GEN. CHAR. *Root*, a mass of woolly fibres. *Frond* flat, membranaceous, ribless, reticulated, dichotomous or irregularly cleft. *Fructification* consisting of scattered or clustered somewhat prominent seeds on both surfaces of the frond.

DICTYOTA *atomaria*; *frond* broadly wedge-shaped, or somewhat fan-shaped, deeply and irregularly cleft longitudinally; seeds forming waved transverse lines, with intermediate broken ones.

DICTYOTA *atomaria*, Grev. *Alg. Brit.* p. 58. *Hook. Br. Fl.* vol. ii. p. 280. *Wyatt. Alg. Danm.* no. 60. *Endl. 3rd Suppl.* p. 24. *Harv. Manual*, p. 32. *J. Ag. Alg. Medit.* p. 37. *Menegh. Alg. Ital.* vol. i. p. 229.

DICTYOTA *zonata*, Lamour. *Es.* p. 57.

DICTYOTA *ciliata*, Lamour. *Es.* p. 58.

ZONARIA *atomaria*, Ag. *Sp. Alg.* vol. i. p. 128. *Ag. Syst.* p. 264. Grev. *Fl. Edin.* p. 298. Gray, *Br. Pl.* vol. i. p. 341.

PADINA *atomaria*, Montag. *Fl. Canar. Pl. Cell.* p. 146.

PADINA *phasiana*, Bory, *Fl. Pelop.* p. 75.

STYPOPODIUM *atomarium*, Kütz. *Phyc. Gen.* p. 341.

ULVA *atomaria*, Woodw. in Linn. *Trans.* vol. iii. p. 53. *Eng. Bot.* t. 419.

ULVA *serrata*, DeCand. *Fl. Fran.* vol. ii. p. 11. *Encycl. Bot.* vol. viii. p. 166.

HAB. On marine rocks, rare. Annual. Summer. At Cromer, Mr. Wigg. Corton and Gunton, Mrs. Fowler. Worm's Head, Glamorganshire, Mr. Dillwyn. Coast of Devon, Mrs. Griffiths. Sussex, Mr. Borrer. Frith of Forth, Dr. Greville. Ballycotton, coast of Cork, Miss Ball.

GEOGR. DISTR. West Indies, Lamouroux. Canary Islands, rare, Despréaux. Mediterranean Sea, Agardh. German Ocean. Atlantic Coasts of France and Spain.

DESC. *Root*, a broad mass of woolly, entangled, brown fibres. *Fronds* clustered, from 3 to 12 inches long, and from half an inch to 3 inches wide, delicately membranaceous, translucent, pale olive-green above, becoming darker towards the base, glossy, broadly wedge-shaped, variously cleft from the apex downwards, sometimes very much jagged, never quite entire; the lateral margins either entire or ciliato-dentate; the tips of the laciniae truncate. *Seeds* disposed in dark brown wavy transverse bands, running across the whole frond, at intervals of less than an inch, the spaces between more or less densely mottled with broken lines or irregular spots of seeds.

This beautiful plant was discovered towards the end of the last century by Mr. Lilly Wigg, on the coast of Norfolk, and first published in the third volume of the Linnæan Transactions by

Mr. Woodward, whose paper was read December 2nd, 1794. In 1797 a figure of it appeared in the "English Botany," notwithstanding which in 1804 in the list of Spanish Algæ appended to Clemente's "Essai sur les variétés de la vigne," &c., and again in 1805, in De Candolle's 'Flore Française' we find two new names bestowed upon it. Since then, as will be seen from the above synonymes, (and we have not quoted all) authors have sufficiently exercised their fancy and invention in re-naming it. Of the newer names, Bory's "*phasiana*" is the most appropriate, the brown bars on the frond reminding us of the plumage of a pheasant, and could we with propriety adopt any, it would be this one. But in justice to the original describer, and following Agardh and most recent authors we adhere to the specific name under which it was first made known.

Though widely distributed along the shores of the Northern Atlantic from the tropics to lat. 56° north, it is nowhere very common. Specimens from Dominica, given to me by Dr. Greville, are of a darker colour than British ones, and much more regularly banded, the broken bars, which generally cover the spaces between the perfect bands, being very few. In England it is completely a summer plant, reaching its perfection in July and decaying before the end of September, at which season it has lost its glossy surface, rich colours, and much of its delicacy. Its remains are then coarse, almost coriaceous, dirty brown and ragged, and would scarcely be taken by a stranger to be the same species.

While it agrees with others of the genus *Dictyota* in the structure of the frond and in the fructification, it exhibits in general habit an approach to *Padina*, or perhaps more nearly to the restricted genus *Zonaria*, J. Ag., and has been referred by Montagne as well as by Bory to the former genus. I admit that it is a transition species, especially resembling *Padina* in the banded arrangement of its seeds, but notwithstanding minor differences, the aggregate of its characters, in my opinion, compel us to refer it to *Dictyota*, unless with Kützinger, we cut the knot by constructing a new genus for its home.

Fig. 1. *Dictyota atomaria* :—*natural size*. 2. Portion of sorus. 3. Seeds in situ. 4. Seeds removed :—*magnified*.



PLATE CIII.

DICTYOTA DICHOTOMA, *Lamour.*

GEN. CHAR. *Root* coated with woolly fibres. *Frond* flat, membranaceous, ribless, reticulate, dichotomous or irregularly cleft. *Fructification*, scattered clusters of spores formed beneath the cuticle, through which they finally burst; or, on distinct plants, solitary spores irregularly dispersed over the surface. DICTYOTA (*Lamx.*)—from δικτύον, a net; because the surface is reticulated.

DICTYOTA *dichotoma*; frond regularly dichotomous, linear; segments cuneate at the base, erect or erecto-patent, gradually narrower towards the apices, axils rounded.

DICTYOTA *dichotoma*, *Lamour. Ess.* p. 58. *Grev. Alg. Brit.* p. 57. t. 10. *Hook. Br. Fl.* vol. ii. p. 280. *Harv. in Mack. Fl. Hib. part 3.* p. 177. *Wyatt. Alg. Danm.* No. 10. *Harv. Man.* p. 32. *Duby. Bot. Gall.* p. 954. *Menegh. Alg. Ital. and Dalm.* p. 224. *Endl. 3rd. Suppl.* p. 24. *Mont. Fl. Alg.* p. 30.

ZONARIA *dichotoma*, *Ag. Sp. Alg.* vol. i. p. 133. *Ag. Syst.* p. 266. *Hook. Fl. Scot.* vol. ii. p. 90. *Grev. Fl. Edin.* p. 297.

DICHOPHYLLIUM *vulgare*, *Kütz. Phyc. Gen.* p. 337. t. 22. II. f. 1-4.

DICHOPHYLLIUM *dichotomum*, *Kütz. l. c.* p. 338.

HALISERIS *dichotoma*, *Spreng. Syst. Veg.* vol. 4. p. 328.

ULVA *dichotoma*, *Huds. Fl. Ang. Ed.* vol. ii. p. 568. (ed. vol. i. p. 476.), *Lightf. Fl. Scot.* p. 975. t. 34. *With. vol. iv.* p. 124. *Eng. Bot.* t. 774. *Lyngb. Hyd. Dan.* p. 31. t. 6. C.

Var. β . *intricata*; frond very narrow, much branched, twisted and entangled, *Grev.*

DICTYOTA *dichotoma*, β . *intricata*, *Grev. Alg. Brit.* p. 58. *Menegh. Alg. Ital. and Dalm.* p. 227.

DICTYOTA *implexa*, *Lamx. l. c. J. Ag. Alg. Medit.* p. 37. *Mont. Fl. Alg.* p. 30.

DICHOPHYLLIUM *implexum*, *Kütz. Phyc. Gen.* p. 338.

HAB. Parasitical on various Algæ; also growing on rocks and stones in tide-pools near low-water mark, and at a greater depth. Annual. Summer. Both varieties common on the British Coasts.

GEOGR. DISTR. Abundant throughout the Atlantic Ocean, extending from the shores of Norway to the tropic. Southern Ocean, Western Shores of South America; Cape of good Hope; New Zealand.

DESCR. *Root* small, coated with fibres. *Fronde*s several from the same base, from three to twelve inches in length, from $\frac{1}{8}$ to $\frac{1}{2}$ an inch in breadth, cuneate at base, afterwards nearly linear, very many times divided in a regularly dichotomous manner; segments generally very erect, with narrow interstices, occasionally more or less spreading. *Substance* delicately membranaceous, *Colour* olivaceous towards the tips. *Fructification*; oval clusters of spores,

covered at an early age with a vesicular membrane formed by a blistering of the cuticle, fixed by their bases, obovate, with a wide limbus, and finally parted into four sporules. 2. (on distinct plants) solitary, roundish spores (?) scattered among the cells of the surface.—Var. β . is very much narrower, about a line in diameter at the base, and not a fourth of a line above, dark brown, coarser in substance, with more patent axils, and frequently spirally twisted.

A very common plant, the most widely dispersed of the genus to which it belongs, being found along the shores of the greater part of the temperate ocean, and also in many intertropical localities. As might be expected, it varies considerably according to the circumstances under which it grows, though without any respect to *climate*, the most opposite varieties being frequently found on the same shore. The variations appear to result merely from the depth of water at which the plant grows, and the degree of exposure to waves and currents to which it is subjected. In rock-pools near high-water mark and to half-tide level the narrow variety, which sometimes is much narrower and greatly more intricate than our figure represents, is the commoner. Near low-water mark in rock-pools, and among the *Laminariæ* in sheltered bays, the broad variety occurs, of which the average size is represented in the figure; but some specimens in my Herbarium, gathered by Miss Hincks, at Ballycastle, on the coast of Antrim, are very much wider and proportionably less compound, and bear a considerable resemblance to the tropical *D. Schröderi*.

The narrow variety, especially when spirally twisted as it commonly is, looks very like a different species, and is regarded by several continental authors as such. But it is merely distinct in its extreme forms. Intermediate specimens connect it absolutely with the broader individuals, and differences in relative breadth are the most uncertain of all characters, especially among the leafy marine plants. The diameter of cylindrical kinds is more constant.

Fig. 1. *DICTYOTA DICHOTOMA*, var. α . 2. The same, var. β :—both of the natural size. 3. Portion of the frond with a vertical view of a sorus. 4. A vertical section of a sorus. 5. A spore. 6. Portion of the frond, with scattered spores:—all magnified.



PLATE LXX.

STILOPHORA RHIZODES, *J. Ag.*

GEN. CHAR. *Root* a small, naked disc. *Frond* filiform, solid or tubular, branched. *Fructification*, convex, wart-like sori scattered over the surface, composed of obovate spores nestling among moniliform, vertical filaments. STILOPHORA (*J. Ag.*),—from *στιλη*, a *point* or *dot*, and *φορέω*, to *bear*; in allusion to the dot-like fructification.

STILOPHORA *rhizodes*; frond subsolid, much and irregularly branched, the branches subdichotomous, attenuated; ramuli scattered, forked; fructification densely covering the whole plant.

STILOPHORA *rhizodes*, *J. Ag. Linn.* vol. xv. p. 6. *Endl. 3rd Suppl.* p. 26.

SPERMATOCHNUS *rhizodes*, *Kütz. Phyc. Gen.* p. 335.

SPOROCHNUS *rhizodes*, *Ag. Sp. Alg.* vol. i. p. 156. *Ag. Syst.* p. 260. *Spr. Syst. Veg.* vol. iv. 329. *Grev. Alg. Brit.* p. 43. t. 6. *Hook. Br. Fl.* vol. ii. p. 275. *Harv. in Mack. Fl. Hib.* part 3. p. 173. *Wyatt, Alg. Danm.* no. 5. *Harv. Man.* p. 27 (excl. var. β).

CHORDARIA *rhizodes*, *Ag. Syn.* p. 15. *Lyngb. Hyd. Dan.* p. 52. t. 13.

FUCUS *rhizodes*, *Turn. Hist.* t. 235.

CONFERVA *rhizodes*, *Ehr. in Herb.*

CONFERVA *gracilis*, *Wulf. Crypt. Aquat.* no. 23.

CONFERVA *verrucosa*, *E. Bot.* t. 1688.

CERAMIIUM *tuberculosum*, *Roth, Cat. Bot.* vol. ii. p. 162. vol. 112.

HAB. Near low water mark, growing either on rocks, or parasitically on other Algæ. Annual. Summer. Southern shores of England, frequent. Common on the eastern, southern, and western shores of Ireland. Belfast Bay, and Strangford Lough, *Mr. W. Thompson*. Jersey, *Miss White* and *Miss Turner*.

GEOGR. DISTR. Atlantic shores of Europe. Baltic Sea.

DESCR. *Root*, minute, scutate. *Fronds* solitary, or tufted, from six inches to two feet, or more, in length, cylindrical, filiform, much and irregularly branched, sometimes pretty regularly dichotomous, sometimes with a leading stem bent in a flexuous or zigzag manner, and furnished with closely set, alternate branches, which are more or less regularly dichotomous. In some specimens several of the branches are secund, and plentifully beset with short, simple, or forked ramuli; in others the branches are bare and but little divided. In all varieties the axils are obtuse, and the apices taper to a more or less fine point. The fructification is very densely dispersed over the whole frond, giving the branches a warted or knotted aspect. The warts are either hemispherical or oval, and consist of radiating, beaded, clavate, simple filaments, among which obovate spores, with wide borders, and narrow, tapering bases are found fixed to the surface of the frond. In a young state the frond is quite solid, composed of roundish or subhexagonal cells, the outermost of which

are gradually smaller; in age the centre becomes more or less hollow. *Substance* when fresh, cartilaginous, but if kept long, becoming very gelatinous and slippery, giving out in fresh water, considerable quantities of slimy matter. *Colour* yellowish brown, either drying to an olive, or retaining much of its original hue.

Hitherto, in British works, the plant here figured has been regarded as a species of *Sporochnus*. It is now removed, according to the views of all recent continental authorities, to the *Dictyotæ*, in which family it constitutes the type of a new genus. If we compare its fructification with that of *Asperococcus*, or of *Punctaria*, we shall be satisfied that its true place in the system cannot be very far apart from these genera. The difference, indeed, is more in the nature of the frond, and the general habit, than in the fructification. From the true *Sporochni*, one of which we have figured at Pl. LVI. the fructification of the present plant essentially differs, the position of the spores, their form, and the nature of the filaments that accompany them, being quite dissimilar.

The var. β . of British authors is now regarded by Professor J. Agardh as a distinct species, called by him *Stilophora Lyngbyei*. I have some hesitation in admitting it to the rank of a species notwithstanding its peculiar character, and the great abundance and uniformity of its production, wherever it occurs; and it has been found from the south of Ireland to the Orkneys, everywhere preserving the fistular stem, divaricated branches, and attenuated ramuli. It is always found in deeper water than the normal form, and always in land-locked bays, and these modifying causes I have hitherto believed, produce the variations. It is, however, at least a well-marked variety, and, as such, deserving of a figure and description, both which I purpose affording it in a future number of this work.

Fig. 1. *STILOPHORA RHIZODES*:—*the natural size*. 2. Part of a branch. 3. Transverse section of the same. 4. Section of a sorus. 5. Spores:—*all more or less highly magnified*.



W.H.H. del. et lith.

R.B. & R. imp.

PLATE CCXXXVII.

STILOPHORA LYNGBYÆI, *J. Ag.*

GEN. CHAR. *Root* a small, naked disc. *Frond* filiform, solid or tubular, branched. *Fructification*, convex, wart-like sori scattered over the surface, composed of obovate spores nestling among moniliform, vertical filaments. STILOPHORA (*J. Ag.*)—from *στιλη*, a *point* or *dot*, and *φορεω*, to *bear*; in allusion to the dot-like fructification.

STILOPHORA *Lyngbyæi*; frond tubular, at length distended, much branched, the branches dichotomous, spreading, with wide, rounded axils, much attenuated toward the apices; ramuli scattered, forked, capillary; sori subdistant, disposed in transverse lines.

STILOPHORA *Lyngbyæi*, *J. Ag. Symb.* vol. i. p. 6. *Sp. Alg.* vol. i. p. 84. *Endl.* 3rd *Suppl.* p. 26.

SCYTOSIPHON *paradoxus*, *Fl. Dan.* t. 1595. f. 2.

SPERMATOCHNUS *paradoxus*, *Kütz. Phyc. Gen.* p. 335.

CHORDARIA *paradoxa*, *Lyngb. Hyd. Dan.* p. 53. t. 14.

STRIARIA *Grevilleana*, *Pollexf. MS.*

SPOROCHNUS *rhizodes* β *paradoxa*, *Ag. Sp. Alg.* vol. i. p. 157. *Grev. Alg. Brit.* p. 43. *Hook. Br. Fl.* vol. ii. p. 275. *Harv. Man.* p. 27.

HAB. In land-locked bays, and estuaries, on a muddy and sandy bottom, in 4–10 fathom water. Annual. Summer. Several places on the shores of Scotland and Ireland, abundantly.

GEOGR. DISTR. Baltic Sea. Atlantic Coasts of Europe. Mediterranean Sea.

DESCR. *Root*, a small disc. *Fronds* from two to four or six feet in length, from one to two lines in diameter at their widest part, but tapering to a capillary fineness towards the apices, usually tufted, and sometimes covering the ground in continuous patches that spread over several square yards. *Stem* very much branched in a dichotomous manner, becoming irregular by the occasional suppression of one of the arms of the fork; the divisions widely spreading, with very broad, rounded axils; the forks distant below, gradually nearer towards the apex. The lower part of the stem becomes, in age, much distended, with a wide cavity and thin walls, the whole of the central cellular substance dying out; in younger parts it is more solid. *Warts* of fructification more distant than in *S. rhizodes*, and placed in transverse, slightly spiral bands, containing obovate spores attached to club-shaped paranemata. *Colour* a pale, testaceous brown, olive toward the tips, and becoming greener in drying, especially after the specimen has been steeped in fresh water. *Substance* when recent crisp, and very brittle; soon becoming flaccid and somewhat tough, giving out mucus. It closely adheres to paper.

Hitherto this plant has appeared in British works as a variety of *S. rhizodes*, figured at Plate LXX, and notwithstanding its different appearance, when *typical* specimens of each are under examination, it is not without hesitation that I admit the present to be specifically distinct. Those who are acquainted with the difference in aspect assumed by marine plants, according to the depth of water at which they grow, will best understand my doubts; remembering that the typical *S. rhizodes* grows within tide-marks, and *S. Lyngbyæi* at a considerable depth, beyond the reach of the tide. And the differences between the two are precisely of the nature of those caused by deep water. If we regard *size*, we must remember that *Asperococcus Turneri* in tide pools is seldom more than six inches long; and that when growing with our *S. Lyngbyæi*, which it frequently accompanies, it has fronds three or four feet in length and proportionably broad. So also *Gracilaria confervoides*, which grows to six or seven feet in length in deep water. The *distention* of the frond in *Stilophora* and the attenuation of the branches likewise increase with depth. On the whole, therefore, the characters typical of our *S. Lyngbyæi* become more strongly marked as the depth of water increases, and appear to me greatly to depend on locality. It is for this reason that I am inclined to question its right to be considered a species, distinct from *S. rhizodes*.

Fig. 1. STILOPHORA LYNGBYÆI;—part of a frond, *the natural size*. 2. Segment of a branch. 3. Cross section of the same. 4. Section of a wart. 5. Spore and paranemata, from the same;—*all magnified*.

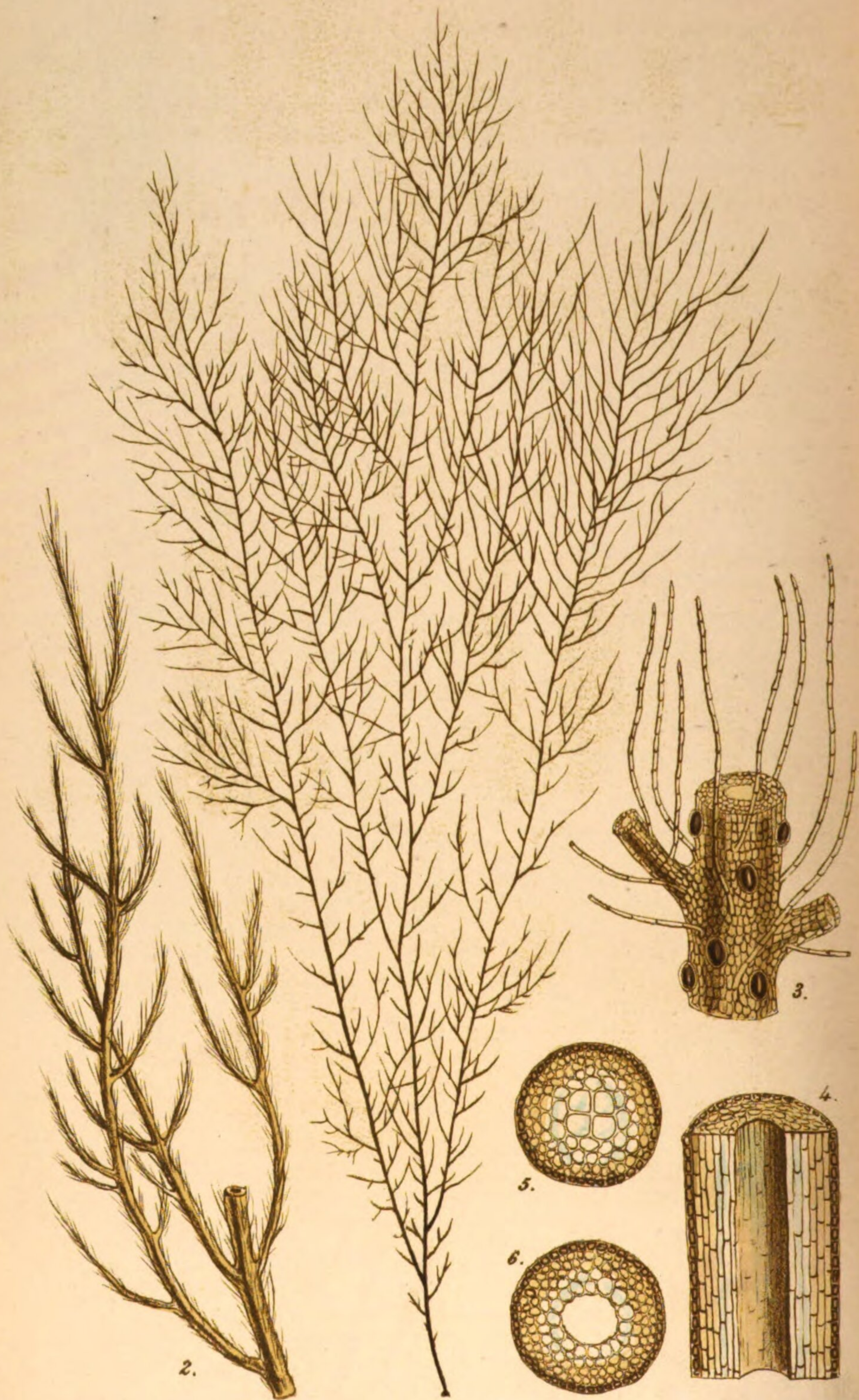


PLATE CCCXXVI.

DICTYOSIPHON FÆNICULACEUS, Grev.

GEN. CHAR. *Root* a small, naked disc. *Frond* filiform, tubular, branched; its walls composed of several rows of cells, of which the inner are elongated, and connected in longitudinal filaments; the outer small, polygonal, forming a membrane. *Fructification*, solitary or aggregated naked *spores*, scattered irregularly over the surface. DICTYOSIPHON (Grev.),—from δίκτυον, a net, and σίφων, a tube; because the frond is hollow, and has a netted surface.

DICTYOSIPHON *fœniculaceus*; frond setaceous, very much branched; branches capillary, decompound; ramuli subulate, alternate or scattered, rarely opposite.

DICTYOSIPHON *fœniculaceus*, Grev. *Alg. Brit.* p. 56. tab. viii. *Hook. Br. Fl.* vol. ii. p. 279. *Wyatt, Alg. Danm.* no. 205. *Harv. in Mack. Fl. Hib.* part 3. p. 176. *Harv. Man.* ed. 1. p. 32. ed. 2. p. 40. *J. Ag. Sp. Alg.* vol. i. p. 82. *Kütz. Sp. Alg.* p. 485. *Aresch. Phyc. Scand.* p. 147. t. 6, 7, 8 (in part). *E. Bot. Suppl.* t. 2746.

SCYTOSIPHON *fœniculaceus*, *Ag. Sp. Alg.* vol. i. p. 164. *Ag. Syst.* p. 258. *Lyngb. Hyd. Dan.* p. 63. t. 14.

FUCUS *subtilis*, *Turn. Hist.* t. 234.

CONFERVA *fœniculacea*, *Huds. Fl. Angl.* vol. ii. p. 594. *Light. Fl. Scot.* vol. ii. p. 981.

CONFERVA *marina fœniculacea*, *Dill. Hist. Musc.* p. 16. t. 2. f. 8.

HAB. In rock-pools, between tide-marks, either on stones, or growing parasitically on other Algæ. Annual. Spring and summer. Common on the coast.

GEOGR. DISTR. Atlantic shores of Europe and of North America. Baltic Sea.

DESCR. *Root* a very small disc. *Stem* from six inches to one or two feet or more in length, varying from a quarter to half a line in diameter, generally undivided, but densely furnished throughout its entire length with lateral branches. *Branches* long, similar to the stem, and excessively branched in a very irregular manner. Sometimes the secondary branches are very densely set, capillary, elongated and simple, or nearly so. Sometimes they are short, curved, and twice or thrice divided. Commonly they are decompound and bushy, plentifully furnished with subulate, acute ramuli, which are either scattered or rarely opposite. When young, the whole frond is densely clothed with pellucid, jointed hairs. It is at first solid, but the central cells, which are much larger than the rest, are also weaker and soon perish, leaving the stem and branches fistular. The walls of the tube are composed of several layers of longitudinally connected cylindrical cells, of which the inner ones are elongate, the rest gradually shorter; the

cells of the superficial layer (or epidermis) being short and either square or polygonal. *Spores* scattered freely over the branches. (On some individuals I have observed aggregated spores, forming scattered clusters or sori.) *Colour* a pale olivaceous, becoming darker in age and on being dried. *Substance* membranaceous and soft, closely adhering to paper in drying.

A common inhabitant of tide-pools, and not inelegant, especially when clothed with the fine soft hairs which cover its surface closely, when in a young and vigorous state, before it has suffered from the wear and tear of its short existence.

I believe by most British algologists this plant is regarded as *sui generis*, entitled to a clear place in our system of arrangement, and properly referred to the *Dictyoteæ*. But a distinguished Swede, Areschoug, regards it unhesitatingly as an abnormal state of *Chordaria flagelliformis*, in which the horizontal filaments of the periphery have not been developed, and he states that he has found specimens having some of the branches with the structure of *Chordaria*, and some with that of *Dictyosiphon*. This is a subject worth examining, but requiring a very careful and accurate observation.

It is also possible that we have two species, or perhaps more, confounded under this name. I possess specimens collected on the west of Ireland some years ago, having rather a different habit from ordinary forms, and differing in having their spores collected in clusters, as in *Striaria*, but not disposed in transverse bands. To these I once gave the MS. name of *D. fragilis*, which is adopted by Kützinger, in his recent 'Systema Algarum.' I have deferred noticing these specimens hitherto, from an unwillingness to multiply doubtful species.

Fig. 1. *Dictyosiphon feniculaceus*:—*the natural size*. 2. Portion of a branch:—*slightly magnified*. 3. Small part of the same, with *fruit* and some hairs. 4. Longitudinal section of the stem. 5. Transverse section of a young branch. 6. The same, of an older branch, now become hollow:—*all highly magnified*.



PLATE XXV.

STRIARIA ATTENUATA, Grev.

GEN. CHAR. *Root* a small, naked disc. *Frond* tubular, membranaceous, continuous, branched. *Fructification*; groups of naked, roundish spores, disposed in transverse lines. STRIARIA—from the spores being arranged in transverse *striæ* or lines.

STRIARIA *attenuata*; branches and ramuli mostly opposite, tapering to each extremity.

STRIARIA *attenuata*, Grev. *Crypt. Fl. (Syn.)* p. 44. *Alg. Brit.* p. 55. t. 9. Hook. *Br. Fl.* vol. ii. p. 279. Harv. in Mack. *Fl. Hib.* part 3. p. 176. Wyatt, *Alg. Danm.* no. 160. Meneg. *Alg. Ital. et Dalm.* p. 157. J. Ag. *Alg. Medit.* p. 41. Endl. *3rd Suppl.* p. 26. Kütz. *Phyc. Gen.* p. 336. t. 21. f. 2. Harv. in Hook. *Journ. Bot.* vol. i. p. 298. Mc'Calla, *Alg. Hib.* no. 18.

SCYTOSIPHON *olivascens*, Carm. MSS.

CARMICHAELIA *attenuata*, Grev. *Sc. Crypt.* t. 288.

ZONARIA *Naccariana*, Ag. MSS. *Nac. Fl. Ven.* vol. vi. p. 94. *Alg. Adr.* p. 82.

ZONARIA *lineolata*, Ag. in *Diar. Ratisb.* 1827. *Ag. Alg. Eur.* t. 40.

STILOPHORA *crinita*, Ag. *Aufzähl.* p. 17. *Nac. Fl. Ven.* vol. vi. p. 94. *Alg. Adr.* p. 83.

SOLENIA *crinita*, Ag. *Syst.* p. 186.

SOLENIA *attenuata*, Ag. *Syst.* p. 187.

ULVA *attenuata*, Nac. *Fl. Ven.* vol. vi. p. 72. *Alg. Adr.* p. 54.

DICTYOTA *lineolata*, Grev. *Syn.* pl. xliii.

CONFERVA *crinita*, Ruch. *Fl. Ven.* p. 269.

HAB. Parasitical on the smaller Algæ, generally growing beyond the tide range. Annual. Summer. Appin, Capt. Carmichael. Bute, Dr. Greville. Belfast Lough, Dr. Drummond. Strangford Lough, Mr. W. Thompson. Torbay, Mrs. Griffiths; Miss Cutler. Roundstone Bay, Mr. Mc'Calla. Devonport, Mr. Ralfs; Rev. W. S. Hore. Penzance and Ilfracombe, Mr. Ralfs.

GEOGR. DISTR. Shores of British Islands. Coast of Sweden, Areschoug! Mediterranean Sea.

DESC. *Root* a small, scutate disc. *Fronds* tufted, 3–12 inches long, or more, from half a line to one or two lines in diameter, tubular, tapering to each extremity, furnished at short intervals with branches similar in form, but of rather less diameter than the main frond, which are again beset with smaller ramuli. *Branches* and *ramuli* mostly opposite, sometimes in threes, rarely scattered, patent, all much constricted at their insertion, and produced at their apices into very fine, setaceous points. When in *fructification*, the branches, in all parts of the frond, are marked, at spaces of half a line asunder, with transverse rings or bands composed of clusters of roundish

spores, lying exposed on the surface of the membrane, and slightly prominent, among which are occasionally seen a few short filaments, similar to those that accompany the spores in several other *Dictyotæ*. *Substance* of the frond delicately membranaceous, closely adhering to paper in drying. *Colour* a pale olive. *Reticulations* of the frond large, quadrate.

As far as the British Flora is concerned, the merit of having discovered this plant belongs to the late talented and indefatigable Captain Carmichael of Appin, who detected it upon the west coast of Scotland, in the year 1825 or 1826. In 1827 a figure of it appeared in Dr. Greville's 'Cryptogamic Flora'; in 1831 it was discovered in Ireland, and in 1833 added to the Flora of Devonshire. But if the very numerous synonymes detailed above, and many of which I have transferred from the excellent work of Meneghini, all belong, as there is little doubt, to our plant, it was first observed in the Mediterranean Sea, where it appears to be not very uncommon, in several places. Not a little remarkable, as connected with its Mediterranean habitat, is the fact that so far from its appearing to delight in warm latitudes, the specimens from Scotland and from the north of Ireland are in every respect stronger and more luxuriant than those found on the Devonshire coast. Other circumstances, exclusive of climate, probably influence the growth of this, as of many other Algæ, very considerably. Of these the principal appear to be shelter, a quiet sea bottom, and a considerable deposit of alluvial matter. In such localities as Belfast and Strangford Loughs the largest specimens I have seen have been found. One of these, in the possession of Dr. Drummond, is considerably larger than that represented in our figure.

A second species of this genus, *S. fragilis*, J. Ag. will probably be found on our shores. The specimens which I possess, so named by Prof. Agardh, are not in a sufficiently perfect state to enable me to form a decided opinion as to their specific character.

I regret that our plate has been printed in too dark an ink, an error which was not perceived till the impressions had been struck off.

Fig. 1. *STRIARIA ATTENUATA*; *natural size*. 2. Portion of a branch. 3. A portion of the membrane, with a sorus. 4. Spores from the sorus:—*all more or less magnified*.



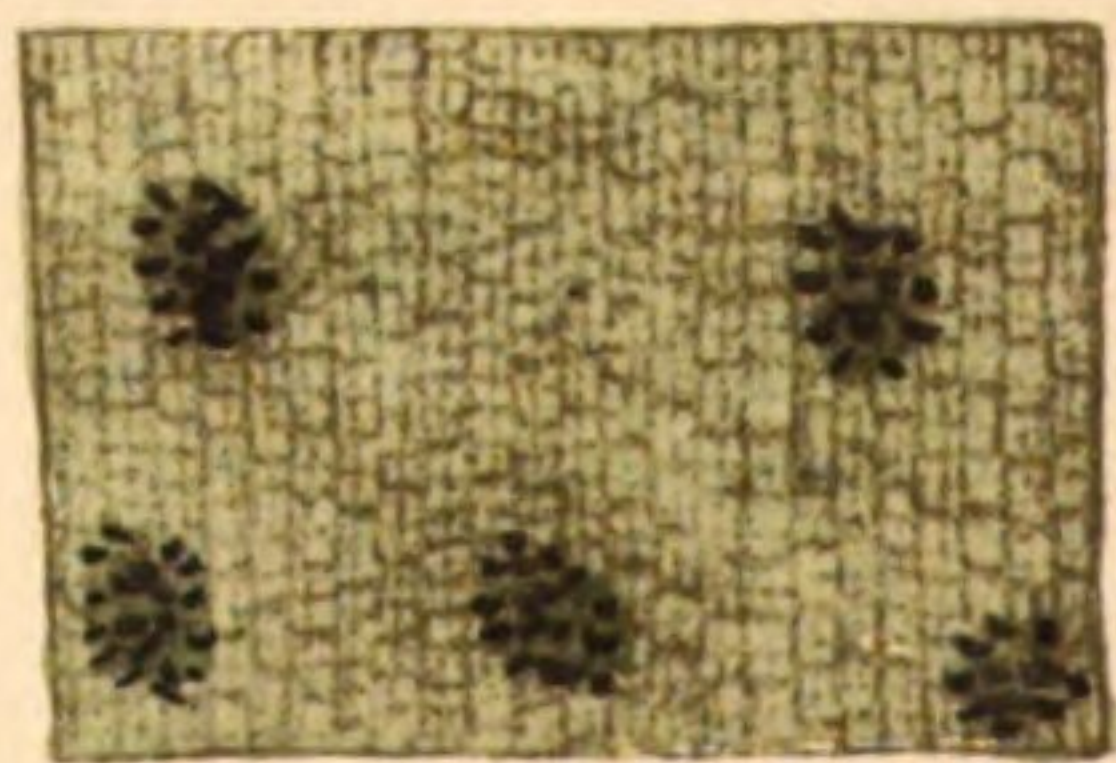
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PLATE VIII.

PUNCTARIA LATIFOLIA, Grev.

GEN. CHAR. *Fronde* undivided, membranaceous, flat, ribless, with a naked, scutate root. *Fructification* scattered over the whole frond in minute distinct dots, composed of roundish prominent seeds intermixed with club-shaped filaments. PUNCTARIA—from *punctum*, a dot; the fruit being in dots, scattered over the surface.

PUNCTARIA *latifolia*; *frond* oblong or obovate, suddenly tapering at the base, pale olive green, thickish, gelatinous and tender.

PUNCTARIA *latifolia*, Grev. *Alg. Brit.* p. 52. Hook. *Br. Fl.* vol. ii. p. 278. Mack. *Fl. Hib.* vol. iii. p. 176. Harv. *Man.* p. 33. Wyatt. *Alg. Danm.* no. 9. J. Ag. *Alg. Medit.* p. 41. Endl. *3rd Suppl.* p. 25. Meneg. *Alg. Ital.* p. 174. PHYCOLAPATHUM *debile*, Kütz. *Phyc. Gen.* p. 292. t. 24. II. (in part).

HAB. Rocks and stones in the sea. Annual. Summer. Sidmouth and Torquay, Mrs. Griffiths. Near Belfast, Dr. Drummond. Islay, Mr. Chalmers. West of Ireland, frequent, W. H. H.

GEOGR. DISTR. British Islands. Mediterranean sea, in several places, J. Agardh. Trieste, Herb. Hooker!

DESC. *Root*, a flat naked disk. *Fronde*s generally forming large tufts, 8–16 inches long, 1–3 inches wide, oblong or lanceolate, flat or more or less curled or wavy, generally obtuse at both extremities, occasionally tapering, when in perfection delicately membranaceous, semitransparent and somewhat gelatinous, but becoming in advanced age thicker and coarser, always of a very pale olive-green colour. Dots of fructification minute, roundish, thickly scattered over both surfaces. It closely adheres to paper if gathered in an early or middle stage of growth, but specimens collected later in the year will not adhere to paper in drying.

This species was founded in 1839 by Dr. Greville, in his admirable ‘*Algæ Britannicæ*,’ on specimens communicated by Mrs. Griffiths and Dr. Drummond, and has since been detected in tolerable plenty on several of our coasts. It is probable that by earlier botanists it was confounded with *P. plantaginea*, to which some of its varieties make a near approach in form, and with which it is often found associated in the same pool. I have specimens of both species gathered side by side by Mrs. Griffiths, who observes, that “*P. plantaginea* is much thicker than *P. lati-*

folia, the meshes of the reticulations longer, and the dots of fructification more oblong." "It is much easier," adds this acute observer, "to see the difference than to describe it in words." The most obvious difference lies in the *colour*;—*P. plantaginea* being of a clear dark brown; *P. latifolia* always very pale. *P. plantaginea* also is usually much narrower, and greatly more tapering, truly cuneate at the base, and much less wavy; but I possess specimens as broad and as little tapering below as many referred to *P. latifolia*. Nor am I very confident, after an attentive comparison of a multitude of specimens, whether there is any absolutely distinguishing character between the two except *colour*, if that be admitted as sufficient. Late in the season *P. latifolia* becomes as coarse and thick as *P. plantaginea*, and will not in the least adhere to paper. A specimen, from Trieste, in Sir W. J. Hooker's herbarium is identical with those from Devonshire; but Dr. J. Agardh states that his Mediterranean specimens are thicker than British ones: it is therefore obvious that the *substance* varies as much in the Mediterranean as I have observed it to do in our seas.

The genus *Punctaria* is exactly analogous among Dictyotæ to *Ulva* in Ulvaceæ, and so closely do its species resemble the Ulvæ in form and substance, that without reference to fructification, or without a close examination of the structure of the frond, a young botanist might sometimes confound the species of one genus with those of the other. It requires also a careful examination to distinguish at all times between *Laminaria debilis* and *Punctaria latifolia*, the form and colour of both being nearly identical. The *Laminaria* is, however, to the naked eye, more glossy and adheres much less firmly to paper; and its structure, instead of being reticulated is closely cellular.

Fig. 1. PUNCTARIA LATIFOLIA :—*natural size*. 2. Base of the frond and scutate root;—*magnified*. 3. Portion of the frond, showing the reticulated structure, and spots of fructification, vertical view;—*magnified*. 4. Sorus, lateral view;—*magnified*.



PLATE CXXVIII.

PUNCTARIA PLANTAGINEA, Grev.

GEN. CHAR. *Frond* undivided, membranaceous, flat, ribless, with a naked, scutate root. *Fructification* scattered over the whole frond, in minute, distinct dots, composed of roundish, prominent spores, intermixed with club-shaped filaments. PUNCTARIA (Grev.),—from *punctum*, a dot; the fruit being in dots, scattered over the surface.

PUNCTARIA *plantaginea*; frond lanceolate or obovato-lanceolate, cuneate and gradually attenuated at base, brownish olive, coriaceo-membranaceous.

PUNCTARIA *plantaginea*, Grev. *Alg. Brit.* p. 53. t. 9. *Hook. Br. Fl.* vol. ii. p. 278. *Harv. in Mack. Fl. Hib.* part 3. p. 175. *Harv. Man.* p. 33. *Wyatt, Alg. Danm.* no. 206. *Endl. 3rd Suppl.* p. 25.

DIPLOSTROMIUM *plantagineum*, Kütz. *Phyc. Gen.* p. 298.

ZONARIA *plantaginea*, Ag. *Sp. Alg.* vol. i. p. 138. *Ag. Syst.* p. 268. *Spreng. Syst. Veg.* vol. iv. p. 326.

ULVA *plantaginea*, Roth, *Cat. Bot.* vol. ii. p. 243 and vol. iii. p. 326. *E. Bot.* t. 2136.

ULVA *plantaginifolia*, Wulf. *Crypt.* no. 3. *Lyngb. Hyd. Dan.* p. 31. t. 6.

LAMINARIA *plantaginea*, Ag. *Syn.* p. 20.

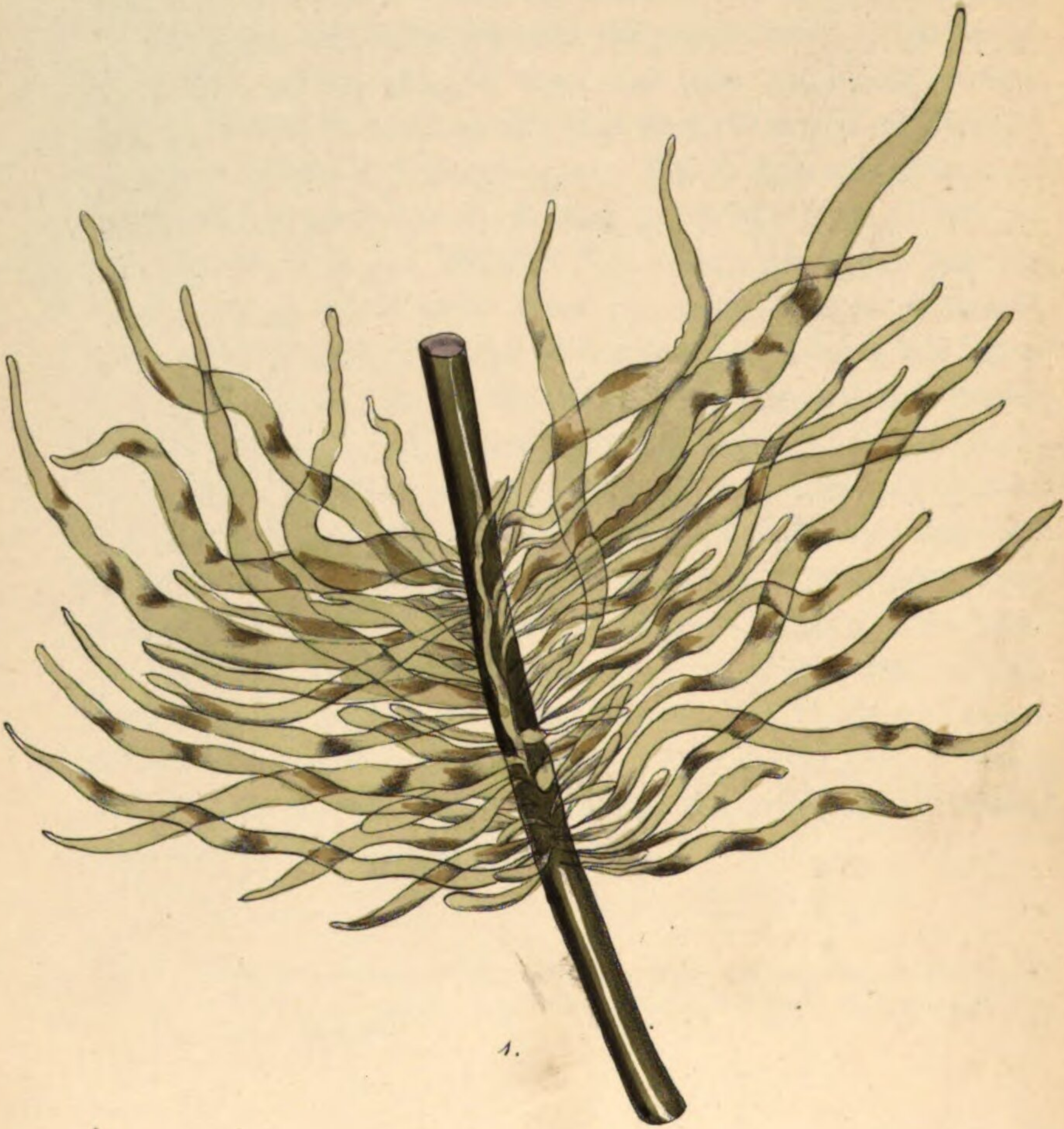
HAB. On rocks and stones, between tide-marks, and in rocky tide pools; occasionally on Algæ. Annual. Spring and summer. Not uncommon on the English and Irish coasts. Frith of Forth, *Dr. Greville*. Orkney, *Rev. J. H. Pollexfen*. Calf Sound, Orkney, in four fathom water, *Lieut. Thomas* and *Dr. Mc Bain*.

GEOGR. DISTR. Atlantic shores of Europe.

DESCR. *Root* small, scutate. *Fronds* densely tufted, from four to twelve inches in length, varying in breadth from less than a quarter of an inch to more than two inches, lanceolate or ovato-lanceolate, more or less tapering to an obtuse or subacute point, cuneate and very much attenuated below, passing by insensible gradations into a minute, setaceous stem. In a young state both surfaces of the frond are clothed with exceedingly tender, subgelatinous, transparent filaments, which give it a peculiarly soft feel, and make the substance appear much thicker than it really is. These gradually wear off as the plant attains its full size. The colour varies from a deep olive to a reddish brown. The surface of the frond is beautifully areolated, the larger cells of the interior being seen through those of the outer coat. *Dots* of fructification, scattered over the whole surface, very minute, somewhat oblong, consisting of several elliptical spores, occasionally accompanied by a few short filaments. Roundish spore-like organs (*antheridia*?) are found on the same plants that produce the regular fructification. They are of larger size than the true spores, irregularly placed, depressed, pale coloured, and contain a granular matter.

By contrasting the figure here given with our representation of *P. latifolia* at Plate VIII., the difference between typical forms of these plants will be readily seen, the present being characterised by its dark colour, cuneate base, and more lanceolate general outline. I wish it could be said that such characters admitted of no approximation to their opposites. But though specimens may be collected in plenty in which these peculiarities can clearly be seen; yet it must be admitted that other individuals are frequently found which show them in a more or less weakened state, and approach in greater or less degree to some of the forms of *P. latifolia*, so that, on the whole, I am disposed to consider these species as not permanently distinguishable from each other. If we take merely the extreme forms of each, such an opinion will appear strange, but it is not arrived at without consideration, and a careful comparison of a great number of specimens from different localities, and collected at different seasons of the year. Nevertheless, as many botanists think differently, and among them my accurate and experienced friend Mrs. Griffiths, I deem it right to retain both species in this work, and to give, of each, such figures as will clearly point out the characters severally attributed to their typical conditions.

Fig. 1. PUNCTARIA PLANTAGINEA; plants:—*of the natural size*. 2. Portion of the surface, with a *sorus*. 3. Portion, with *antheridia*? 4. Section of the frond:—*all magnified*.



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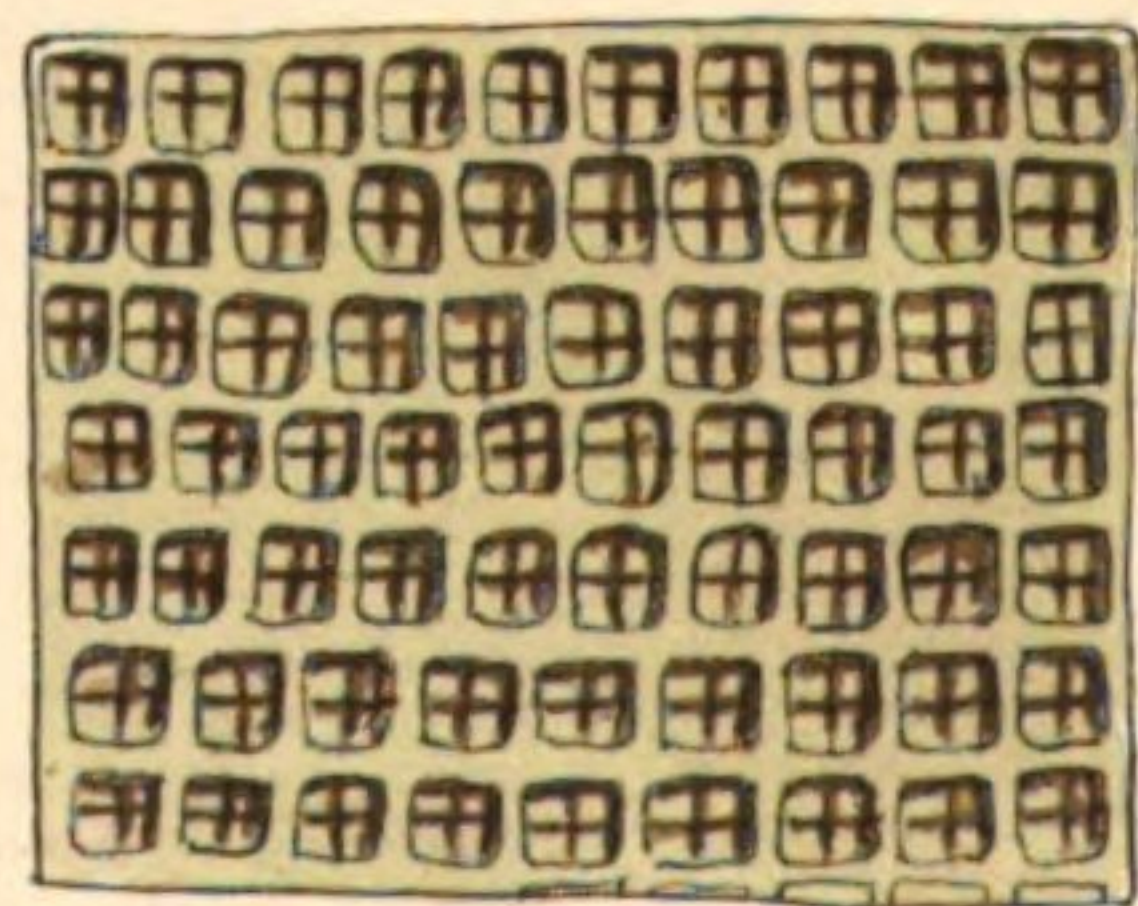


PLATE CCXLVIII.

PUNCTARIA TENUISSIMA, Grev.

GEN. CHAR. *Fronde* undivided, membranaceous, flat, ribless, with a naked, scutate root. *Fructification* scattered over the whole frond, in minute, distinct dots, composed of roundish, prominent spores, intermixed with club-shaped filaments. PUNCTARIA (Grev.),—from *punctum*, a dot; the fruit being in dots, scattered over the surface.

PUNCTARIA tenuissima; frond sublinear, very thin, transparent. Grev.

PUNCTARIA tenuissima, Grev. *Alg. Brit.* p. 54. *Hook. Fl.* vol. ii. p. 279. *Harv. Man.* p. 34.

PUNCTARIA undulata, *J. Ag. Spec.* vol. i. p. 72.

ULVA plantaginifolia, *Lyngb.* p. 31. t. 6. (*fide J. Ag.*)

DIPLOSTROMIUM plantagineum, *Kg. Phyc. Gen.* p. 298.

HAB. Parasitical on *Zostera marina*, *Chorda filum*, &c. near low-water mark. Annual. Summer. Bute, Dr. Greville. Appin, Captain Carmichael. Near Dublin, W.H.H.; probably common.

GEOGR. DISTR. Atlantic Shores of Northern Europe, Baltic Sea. North West Coast of France. North America.

DESCR. *Fronde*s, 2–8 inches long, 1–3 lines wide, very densely tufted, covering the plant on which they grow with innumerable slender wavy ribbons, tapering to the base and apex, but linear for the greater part of their length, sometimes ending bluntly; the margin waved or curled, and either entire, or remotely and irregularly toothed. *Colour*, a very pale shade of brownish olive, or horn-colour, sometimes hyaline. *Substance* exceedingly thin and delicate, adhering to paper. *Structure* beautifully areolated. *Fruit* unknown.

Two species of *Punctaria* have already appeared in this work, and the one now figured completes the representation of the British kinds. The present species has never been found in a state of fruit, and hence some botanists (among others my valued friend Mrs. Griffiths) regard it as the young of some other species; perhaps of *P. latifolia*, with which its substance more nearly agrees, than with that of *P. plantaginea*. But its great difference in form seems to forbid such an opinion being hastily adopted, particularly as young *P. latifolia* may be found of much smaller

size and with a broader and more ovate frond. I rather think that this ignorance of the fruit arises from imperfect observation. The plant does not seem to be found all round the coast, and where it has been observed has been in places only occasionally and hastily visited by botanists; and though I have myself gathered it in my immediate neighbourhood, I must plead guilty to having neglected to watch its growth from the commencement to disappearance. Capt. Carmichael, a very close observer, was persuaded of its distinct character; and I have specimens from North America and the Baltic closely resembling those from our own shores.

According to the younger Agardh the synonyme *Zonaria tenuissima*, Ag., quoted by Greville belongs rather to *Laminaria fascia*; for which reason the Swedish Algologist has substituted the name *undulata* for that here adopted.

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- Fig. 1. PUNCTARIA TENUISSIMA; growing on *Chorda filum*:—natural size.
 2. Small portion of the membrane:—magnified.



PLATE LXXII.

ASPEROCOCCUS COMPRESSUS, *Griff.*

GEN. CHAR. *Frond*, unbranched, tubular, cylindrical, or rarely compressed, continuous, membranaceous. *Root* naked, scutate. *Fructification* scattered over the whole frond, in minute distinct *dots* (*sori*), composed of roundish, prominent spores, mixed with club-shaped filaments. ASPEROCOCCUS,—corruptly formed from *asper*, rough, and *kokkos*, a seed.

ASPEROCOCCUS *compressus*; frond compressed, flat, linear-lanceolate, obtuse; dots of fructification oblong.

ASPEROCOCCUS *compressus*, *Griff. MSS. Hook. Br. Fl.* vol. ii. p. 278. *Wyatt, Alg. Danm.* no. 8. *Harv. Man.* p. 34. *J. Ag. Alg. Medit.* p. 41. *Menegh. Alg. Ital.* p. 164. t. 4. f. 1. *Endl. 3rd Suppl.* p. 26.

HALOGLOSSUM *Griffithsianum*, *Kütz. Phyc. Gen.* p. 340.

HAB. Parasitical on Algæ, beyond low water mark; usually cast on shore. Annual. Summer. Sidmouth and Torquay, *Mrs. Griffiths*. Mounts Bay, *Mr. Ralfs*. Falmouth, *Miss Warren*. Jersey, *Miss Turner*.

GEOGR. DISTR. Southern shores of England. Mediterranean Sea. Cherbourg. Cape Finisterre. Cape of Good Hope, *W. H. H.*

DESCR. *Root*, a small disc. *Frond*, from six to eighteen inches in length, and from a quarter of an inch to an inch and a half in breadth, attenuated at the base into a setaceous stem from a quarter to half an inch long, thence nearly linear upwards for the greater portion of its length, and again fining off towards the blunt point. Some specimens are nearly lanceolate, and much narrowed at the extremity; others are more nearly linear, and very blunt. The frond, though very much compressed, so as to be quite flat, is in reality tubular, but the sides of the tube are closely applied together, and here and there united by slender, colourless, jointed filaments. The surface cellules of the frond are minute; but those coating the inner face of the tube are very large, distended, and hyaline. *Fructification* is always abundantly produced. The *sori* are oblong, very densely scattered, and of larger size than in *A. Turneri*. The *Colour* varies from a pale yellowish to a full olive-green, occasionally brownish in age. The *substance* is tender, somewhat gelatinous, and the plant in drying, adheres perfectly to paper.

An interesting plant, curiously connecting the genus *Asperococcus* and *Punctaria*, having a frond nearly intermediate in character between that of these genera, but possessing rather more of the structure of the former. It was discovered by Mrs. Griffiths in the year 1828, at Sidmouth, and should it ever be

made the type of a new genus, as proposed by Kützing, his specific name, *Griffithsianum*, may very deservedly be adopted. At present I prefer leaving it in *Asperococcus*, from its very close affinity both with *A. echinatus* and *A. Turneri*.

It appears to be of not unfrequent occurrence in the Mediterranean, several stations being recorded. I possess a fine specimen from Catania, given me by M. Gussone; and I have gathered very large specimens at the Cape of Good Hope, much larger than any others that I have seen. It is very rare along the Atlantic coasts of France and Spain, as I am informed by M. Lenormand, who has kindly sent me a specimen gathered at Cherbourg; and may probably occur in North Africa, but I have not received any specimens from that coast. In the British Seas it has as yet, only been found along the southern shores of England, and in the Channel Islands; but it is not improbable that it may yet be discovered on the Irish coast, where so many southern forms reach their northern limit.

Fig. 1. *ASPEROCOCCUS COMPRESSUS*:—*the natural size*. 2. A transverse section of the frond. 3. Portion of the same: more highly magnified 4. Portion of the membrane, viewed vertically. 5. Vertical section of a *sorus*:—*more or less highly magnified*.

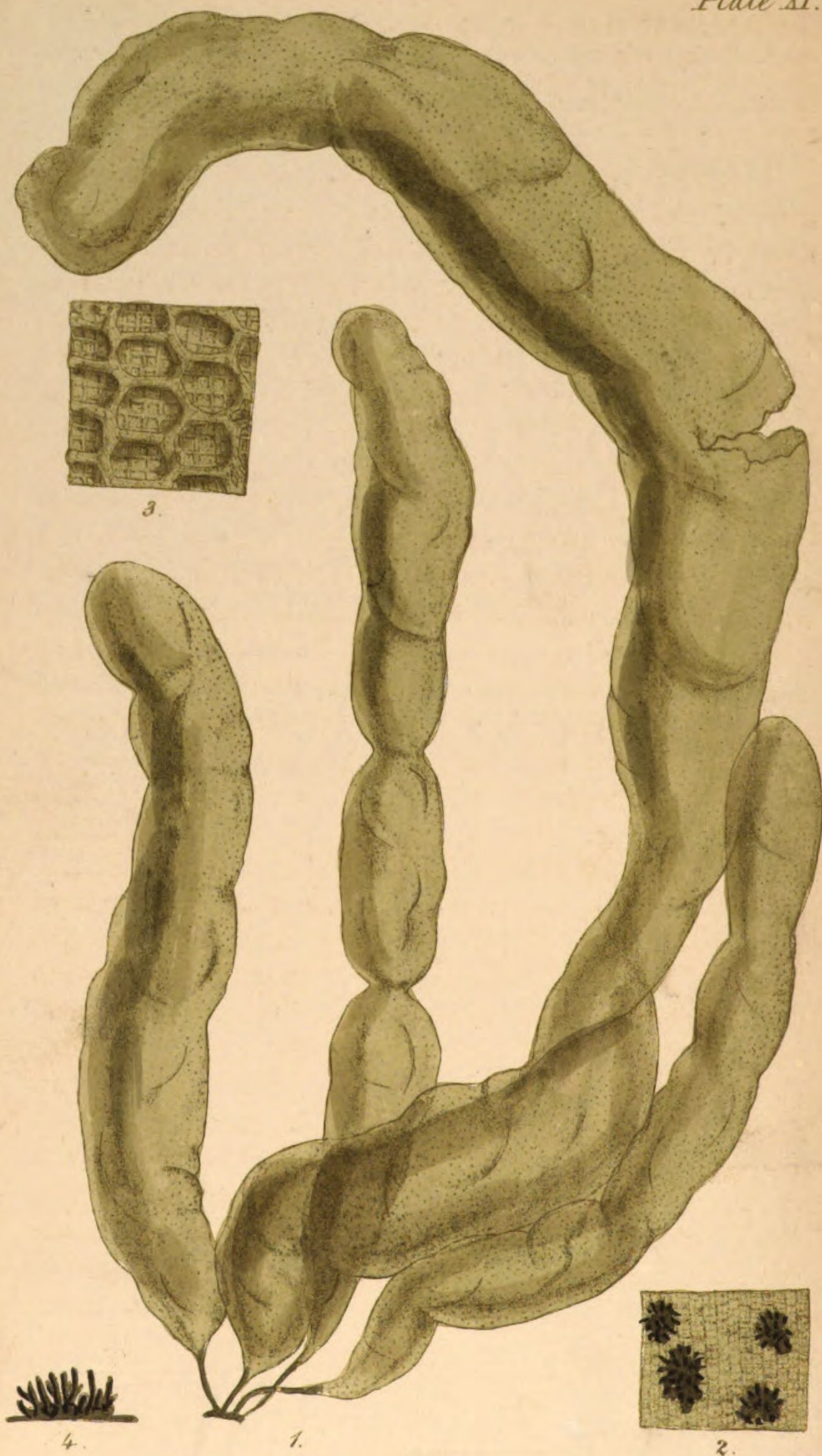


PLATE XI.

ASPEROCOCCUS TURNERI, Hook.

GEN. CHAR. *Frond* unbranched, tubular, cylindrical or rarely compressed, inflated, continuous, membranaceous. *Root* naked, scutate. *Fructification* scattered over the whole frond, in minute, distinct dots, composed of roundish, prominent seeds, intermixed with club-shaped filaments. ASPEROCOCCUS—corruptly formed from *asper*, rough, and *κόκκος*, a seed; because the dots of seeds are mixed with bristle-like filaments.

ASPEROCOCCUS *Turneri*; frond inflated, cylindrical, obtuse, oblong or club-shaped, suddenly contracted at the base into a short stem, thin and membranaceous; dots of fructification minute, roundish.

ASPEROCOCCUS *Turneri*, Hook. *Br. Fl.* vol. ii. p. 277. *Wyatt. Alg. Danm.* no. 59. *Harv. in Mack. Fl. Hib.* part 3. p. 175. *Harv. Man.* p. 34.

ASPEROCOCCUS *bullosus*, *Lamour. Ess.* p. 62. t. 6. f. 5. *Grev. Alg. Brit.* p. 51. *Endl. 3rd Suppl.* p. 26. *J. Ag. Alg. Medit.* p. 41. *Menegh. Alg. Ital. et Dalm.* p. 166.

ASPEROCOCCUS *rugosus*, β *bullosus*, *Dub. Bot. Gall.* vol. ii. p. 956.

ENCÆLIUM *bullosum*, *Ag. Sp. Alg.* vol. i. p. 146. *Syst.* p. 262. *Spreng. Syst. Veg.* vol. iv. p. 328. *Kütz. Phyc. Gen.* p. 326. t. 21. f. 1.

GASTRIDIDIUM *opuntia*, *Lyngb. Hyd. Dan.* p. 71. t. 18.

ULVA *Turneri*, *Dillw. —. Eng. Bot.* t. 2570.

HAB. In the sea, on stones and the larger Algæ, on *Zostera*, &c., often growing in 4–5 fathoms. Annual. Summer and Autumn. Coast of Sussex, *Mr. Borrer*. Devonshire, *Mrs. Griffiths*. Bantry Bay, *Miss Hutchins*. Appin, *Capt. Carmichael*. The “Murrough” at Wicklow, *W. H. H.* (1833). Strangford Lough and Clew Bay, Mayo, *Mr. W. Thompson*. Roundstone Bay, Galway, *Messrs. W. Thompson, R. Ball, and E. Forbes* (1840). Howth, *Miss Ball*. Ireland’s Eye and Lambay, *Mr. R. Ball*. Abundant on the Kerry Coast, *Mr. W. Andrews*. Dingle and Valentia, *W. H. H.* Jersey, *Miss White*.

GEOGR. DISTR. Atlantic coast of Europe, from Norway (*Lyngb.*) to Spain. Baltic Sea. Mediterranean and Adriatic Seas. Southern Ocean, *Agardh*.

DESC. *Root* a minute scutate disc. *Fronds* commonly from 6 to 12 inches in length, and from half an inch to an inch and a half in diameter, but occasionally 16 to 42 inches in length and from 2 to 4 in diameter, suddenly contracted at the base into a thread-like stem, which varies from $\frac{1}{4}$ to $\frac{1}{2}$ an inch in length, inflated, bag-like, and of nearly equal breadth throughout, sometimes club-shaped, very obtuse, here and there occasionally contracted, delicately membranaceous and subtransparent, pale olive or inclining to fawn colour. When young the frond is greenish olive with a soft and subgelatinous feel and adheres to paper, but older specimens are harsher, of rather thicker substance, and will not adhere to paper in drying. Dots of *fructification* very minute, roundish or oblong, sometimes confluent, densely scattered over the surface, composed of dark-coloured, elliptical spores lying on the surface of the frond, among which, in greater or less

abundance, spring short, simple, or slightly branched, jointed filaments. The structure of the membrane, as shown at fig. 3, is very beautiful. The outer surface of the frond is composed of slightly inequilateral, 4- or 5-sided cells with thick walls, and containing a granular, pale-olive endochrome. These are internally strengthened by a lattice-work which lines the whole frond, whose meshes are 12-16 times as large as the cells of the membrane.

We are not informed by whom this species was first observed. The honour rests between Miss Hutchins and Mr. Borrer, by each of whom it was found in different localities early in the present century, and named, by Dillwyn, in honour of Mr. Dawson Turner, the distinguished author of the '*Historia Fucorum*.' Unfortunately Mr. Dillwyn delayed for several years the publication of the species, and it first appeared under this name in the volume of English Botany for 1813; in which same year, Lamouroux, unaware of the long-conferred manuscript name, published it as a new species, conferring upon it the specific name *bullosus*, by which it is still universally known on the continent. It is a question which specific name has the priority in *publication*, and in an ordinary case I should feel bound to follow the majority—who have decided in favour of *bullosus*,—but I am unwilling, without better grounds, to deprive the Father of modern Phycology of a well-merited compliment; and I therefore follow Hooker in retaining the specific name earliest proposed—though not published.

Asperococcus Turneri appears to delight in land-locked muddy bays, where it grows to the gigantic size mentioned in the description. Specimens upwards of three feet in length, have been dredged by Mr. Thompson in Strangford Lough. I have seen individuals not much inferior in the little harbour of Dingle, and in the long, deep channel which divides Valentia from the mainland. When growing in deep water its favourite habitat is on the stems and leaves of *Zostera*. Specimens gathered within the tide range are of much smaller size, not more than a few inches in length. Except in size it is subject to little variation. It may always be known from *A. echinatus* by its greater delicacy of texture, more evident reticulations, paler colour, and more obtuse and inflated frond.

Fig. 1. ASPEROCOCCUS TURNERI. 2. Small section *magnified*, showing the spots of fructification, vertical view. 3. Fragment more *highly magnified*, to shew the internal net-work. 4. One of the spots of fruit, viewed laterally.



PLATE CXCIV.

ASPEROCOCCUS ECHINATUS, Grev.

GEN. CHAR. *Frond* unbranched, tubular, cylindrical, or rarely compressed, continuous, membranaceous. *Fructification* scattered over the whole frond, in minute, distinct dots (*sori*) composed of roundish, prominent spores, mixed with club-shaped filaments. ASPEROCOCCUS (*Lamour.*), corruptly formed from *asper*, rough, and *kokkos*, a fruit or seed.

ASPEROCOCCUS *echinatus*; frond cylindrical, obtuse, or acute, much and gradually attenuated to the base.

ASPEROCOCCUS *echinatus*, Grev. *Alg. Brit.* p. 50. t. 9. *Harv. Man.* p. 35. *Endl. 3rd Suppl.* p. 26.

ASPEROCOCCUS *fistulosus*, Hook. *Br. Fl.* vol. ii. p. 277. *Wyatt, Alg. Danm.* no. 7. *Harv. in Mack. Fl. Hib.* part 3. p. 175.

ASPEROCOCCUS *rugosus*, Lamour. *Ess.* p. 62.

ENCÆLIUM *echinatum*, Ag. *Sp. Alg.* vol. i. p. 145. *Ag. Syst.* p. 261. *Spreng. Syst. Veg.* vol. iv. p. 328. *Kütz. Phyc. Gen.* p. 336.

ENCÆLIUM *Lyngbyanum*, Grev. *Crypt.* t. 290.

SCYTOSIPHON *fistulosus*, Lyngb. *Hyd. Dan.* p. 66.

SCYTOSIPHON *filum*, var. *fistulosum*, Ag. *Sp.* vol. i. p. 163. *Ag. Syst.* p. 258.

ULVA *fistulosa*, Huds. *Fl. Ang.* p. 569. *E. Bot.* t. 642. *Hook. Fl. Scot.* part 2. p. 92.

CONFERVA *fistula*, Roth, *Cat. Bot.* vol. iii. p. 169.

Var. β . frond setaceous, filiform, twisted.

ASPEROCOCCUS *echinatus*, β . *vermicularis*, Harv. *Man.* p. 35.

ASPEROCOCCUS *vermicularis*, Moore, *Ord. Surv. Londonderry, Bot.* p. 9. *Wyatt, Alg. Danm.* no. 207.

HAB. On stones, &c., between tide marks. Annual. Summer and autumn. Common on the British shores.

GEOGR. DISTR. Atlantic coasts of Europe and America. Southern Ocean, at Lord Auckland's Islands, Dr. Hooker.

DESCR. *Root*, a small disc. *Fronde*s densely tufted, from twenty to a hundred growing from nearly the same point, varying from two inches to two feet in length, and from half a line to half an inch in diameter, very much and very gradually attenuated at the base, and more or less tapering upwards, sometimes ending abruptly in a blunt point, sometimes acute, and much drawn out, cylindrical, bag-like, here and there irregularly somewhat narrowed, or slightly constricted. *Fructification* densely sprinkled over the whole frond, forming minute, prominent, rough dots, composed of densely packed, vertical filaments, among which the spores are concealed. In a young state the frond is clothed with long, pellucid fibres. *Substance* membranaceous, soft; when young, slimy, adhering to paper. *Structure* reticulated, the membrane composed of large, lax cells. *Colour* olive, more

or less brown; when young greenish. β . differs in being much more slender, and generally is a parasite on other small Algæ.

A very common, but we cannot say a very beautiful plant; one of the least highly organized of the family to which it belongs, and the coarsest in its mode of growth. The only variation to which it is subject is the size, and the more or less tapering extremities. The size varies so greatly that very good observers have contended for two species, the smaller one of which we retain as a variety, although it passes so insensibly into the larger form that no distinct limits can be assigned between them. From *A. Turneri* (Pl. XI.) this is at once distinguished by the thicker substance, darker colour, tapering base, and by being only moderately inflated. The former species is also remarkable for the bluntness of its frond. The present more nearly resembles *A. compressus*, (Pl. LXXII.), some ill-coloured and narrow examples of which have very much the outline and general aspect of *A. echinatus*, and can scarcely be known from it except by the character of compression: a character whose distinctness is greatly lost in the dry state.

Other specimens frequently are met with which resemble *Chorda lomentaria*, even to the extent of being here and there constricted. The fructification affords the best mark of distinction from puzzling forms of the latter.

Fig. 1. ASPEROCOCCUS ECHINATUS; fronds:—*of the natural size*. 2. Portion of the tube, with sori:—*magnified*. 3. Section of the membrane and sorus:—*highly magnified*.

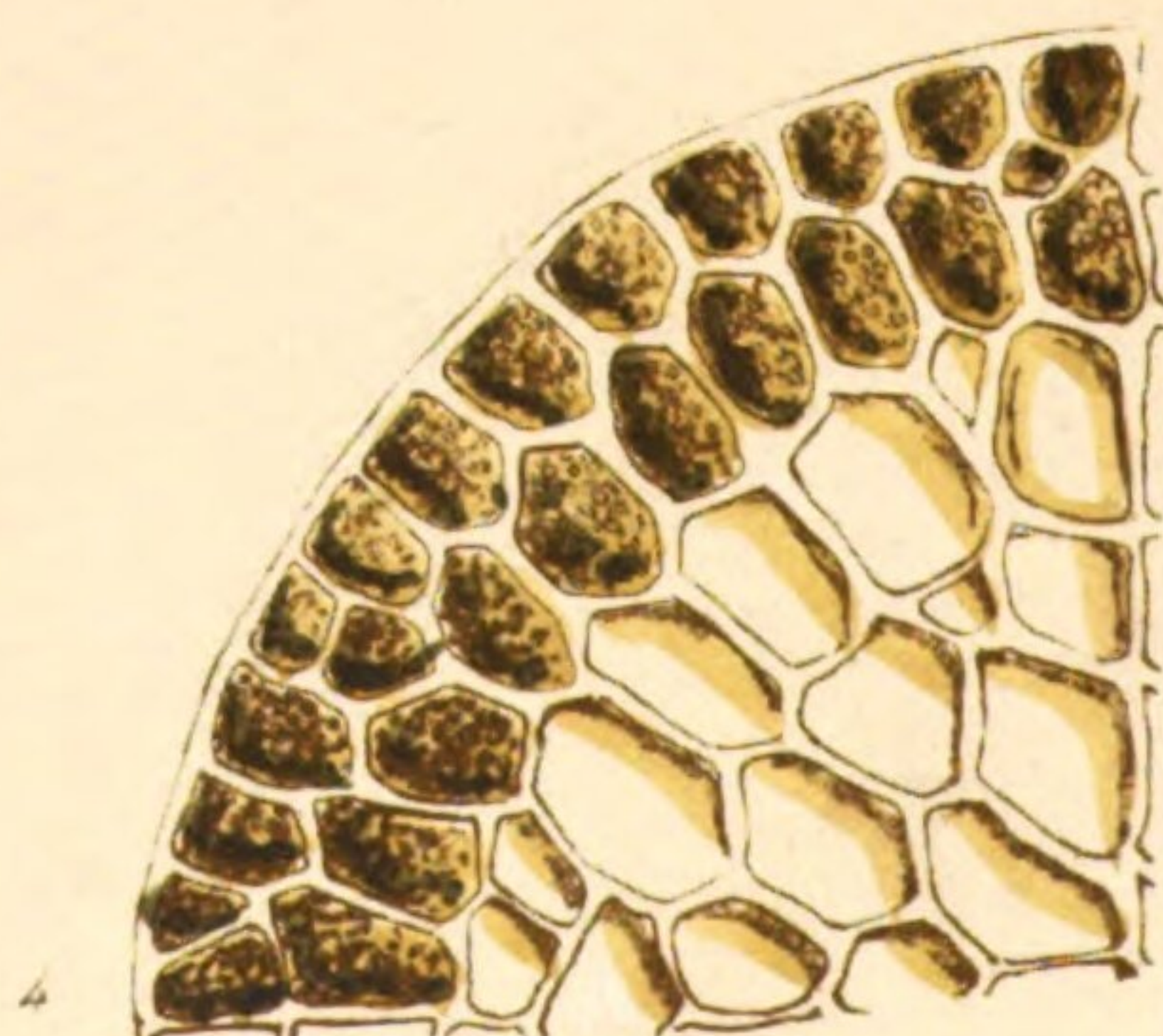
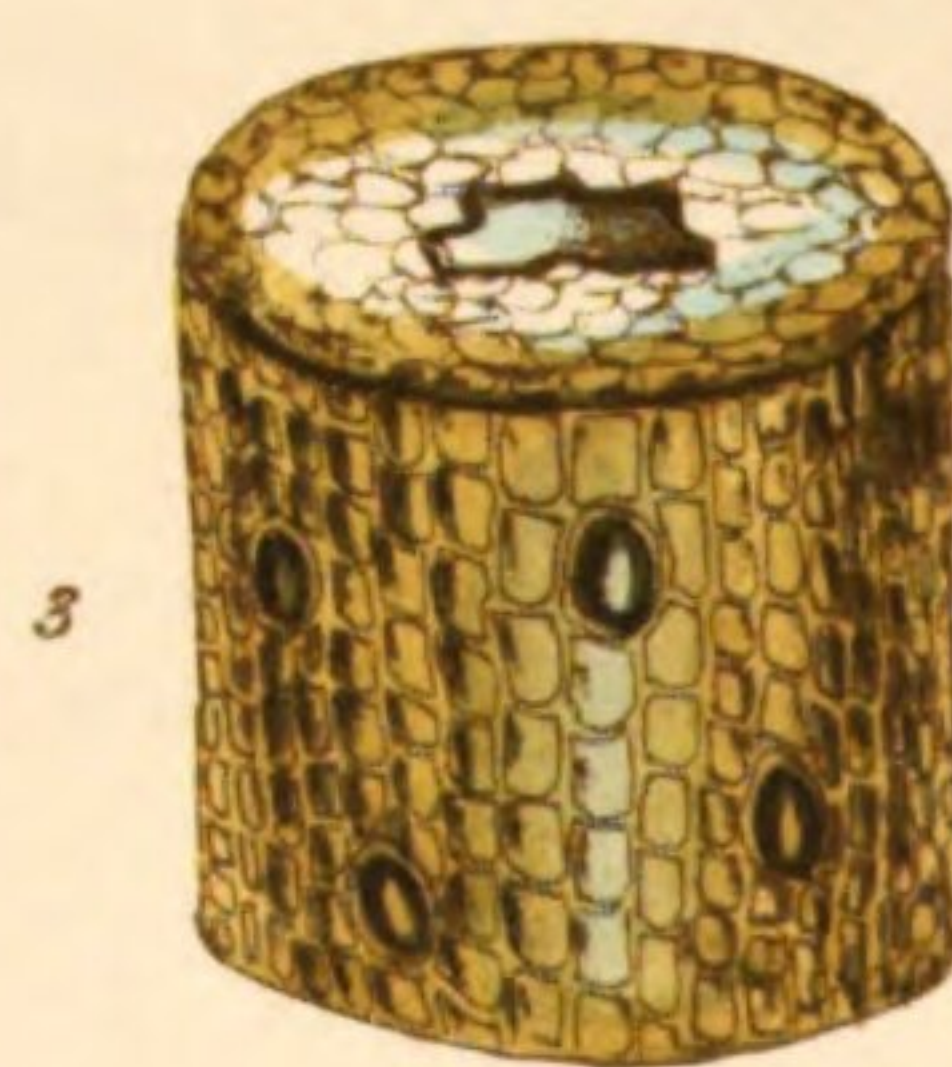
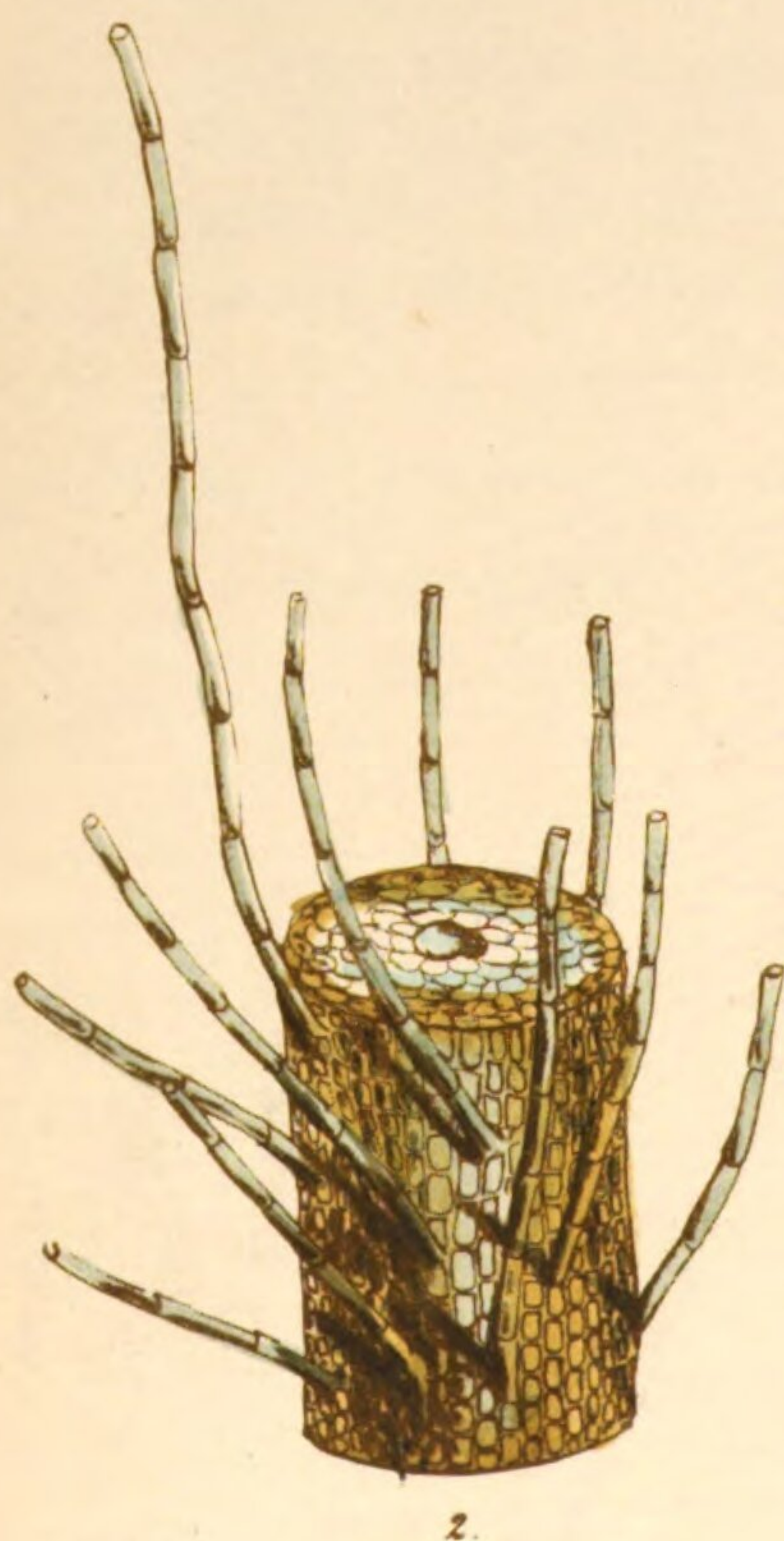
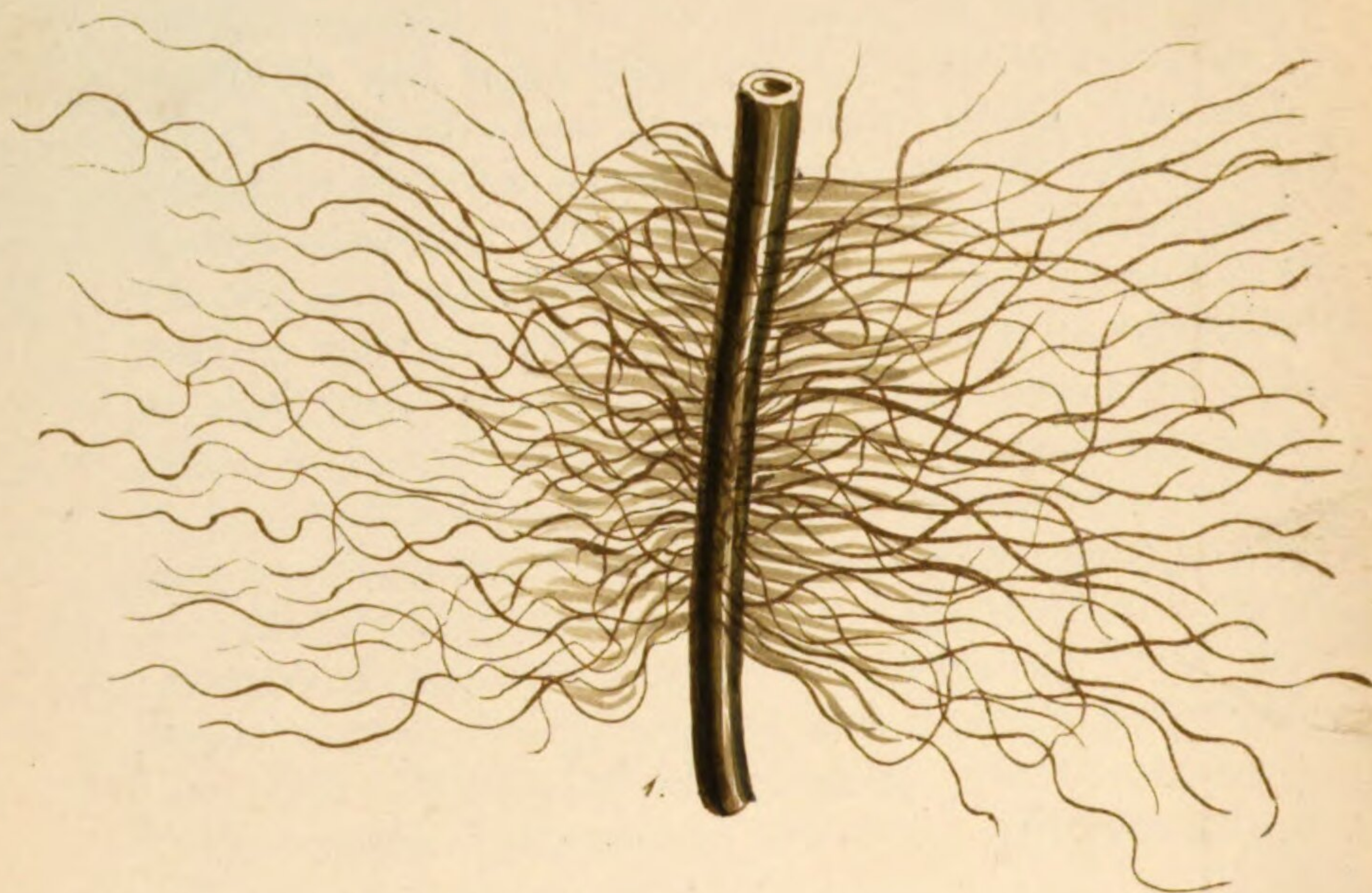


PLATE CCLXX.

LITOSIPHON PUSILLUS, *Har.*

GEN. CHAR. *Frond* unbranched, cylindrical, cartilaginous, subsolid, at length tubular, composed of several rows of cells; the surface areolated. *Fructification*; solitary or aggregated naked spores, scattered irregularly over the surface of the frond. LITOSIPHON (*Harv.*), from λιτός, *slender* or *mean*, and σίφων, *a tube*.

LITOSIPHON *pusillus*; fronds tufted, thread-shaped, very long, equal in diameter throughout, reticulated, clothed with pellucid hairs; spores scattered.

LITOSIPHON *pusillus*, *Harv. Man. Ed.* vol. ii. p. 43.

CHLOROSIPHON *pusillus*, *Harv. in Phyc. Brit.* vol. i. p. 10. *Kütz. Sp. Alg.* p. 484.

ASPEROCOCCUS *pusillus*, *Carm. in Hook. Br. Fl.* vol. ii. p. 277. *Wyatt, Alg. Danm.* no. 58. *Harv. in Mack. Fl. Hib.* part 3. p. 175. *Harv. Man. Ed.* vol. i. p. 35. *J. Ag. Gen. et Sp. Alg.* vol. i. p. 78.

HAB. Parasitical on CHORDA FILUM. Annual. Summer. Common all round the coast.

GEOGR. DISTR. Shores of Europe.

DESCR. *Fronds* very densely tufted, clothing the plant on which they grow in continuous series for the space of several feet, completely concealing the surface and spreading on all sides equally; from two to four inches long, as thick as hog's bristle, straight, or more commonly variously waved or twisted. When young the whole frond is beset with slender, byssoid, articulated fibres, like those found in *Myriotrichia*. These gradually wear away, and then the fronds become more twisted and less lubricous. In young plants the frond is nearly solid, composed of several strata of cells, the inner ones of which are large and empty, the outer gradually smaller, and those of the two or three external rows (constituting the periphery) filled with granulated endochrome. The central cells first perish, and the plant becomes tubular, but the tube does not seem to have regularly defined limits. The surface under the microscope appears reticulated with quadrate cells, which are disposed in longitudinal lines. Among these cells one is here and there larger and more prominent than the rest, containing a darker-coloured endochrome: these are supposed to be the spores, and no other fructification has yet been observed. *Substance* somewhat cartilaginous, but soft and lubricous, closely adhering to paper. *Colour* at first a greenish, afterwards a brownish olive.

The old fronds of *Chorda filum* are frequently infested, towards the close of summer, with the parasite here figured, which changes them into shaggy ropes, soft and slippery to the touch.

When placed in water the innumerable thread-like fronds of the *Litosiphon* stand out from the *Chorda*, and spread in all directions round it, like the hairs of a bottle-brush.

This plant was originally noticed by Capt. Carmichael, who called it *Asperococcus pusillus*, a name by which it has been generally known to succeeding botanists; although all have admitted that its claim to be regarded as a species of *Asperococcus* was, to say the least, very doubtful. In the list of species appended to the first volume of this work I called it *Chlorosiphon*, supposing that it must be the plant called by Kützing *Chlorosiphon Shuttleworthianus*, a name given by that author to an Alga gathered by Mr. Shuttleworth, on the West Coast of Ireland. I made this reference after reading the description in Kützing's work, but a subsequent communication with that author showed me that I had committed an error, for a specimen of Mr. Shuttleworth's Alga kindly sent to me by Professor Kützing, proves to be that young state of *Chorda lomentaria*, to which Carmichael gave the name *Asperococcus castaneus*. In these circumstances it becomes necessary to bestow a new name on the present plant, and I have chosen one applicable in a double sense.

As a genus it seems to come nearest to *Dictyosiphon*, from which it obviously differs in having an unbranched frond. I am not at all satisfied respecting the nature of the so-called spores, but no other fructification has yet been discovered.

Fig. 1. *LITOSIPHON PUSILLUS*, growing on *Chorda filum*:—of the natural size.
2. Part of a young frond. 3. Part of an older frond, with spores.
5. Quarter of a transverse section of the frond:—more or less highly magnified.

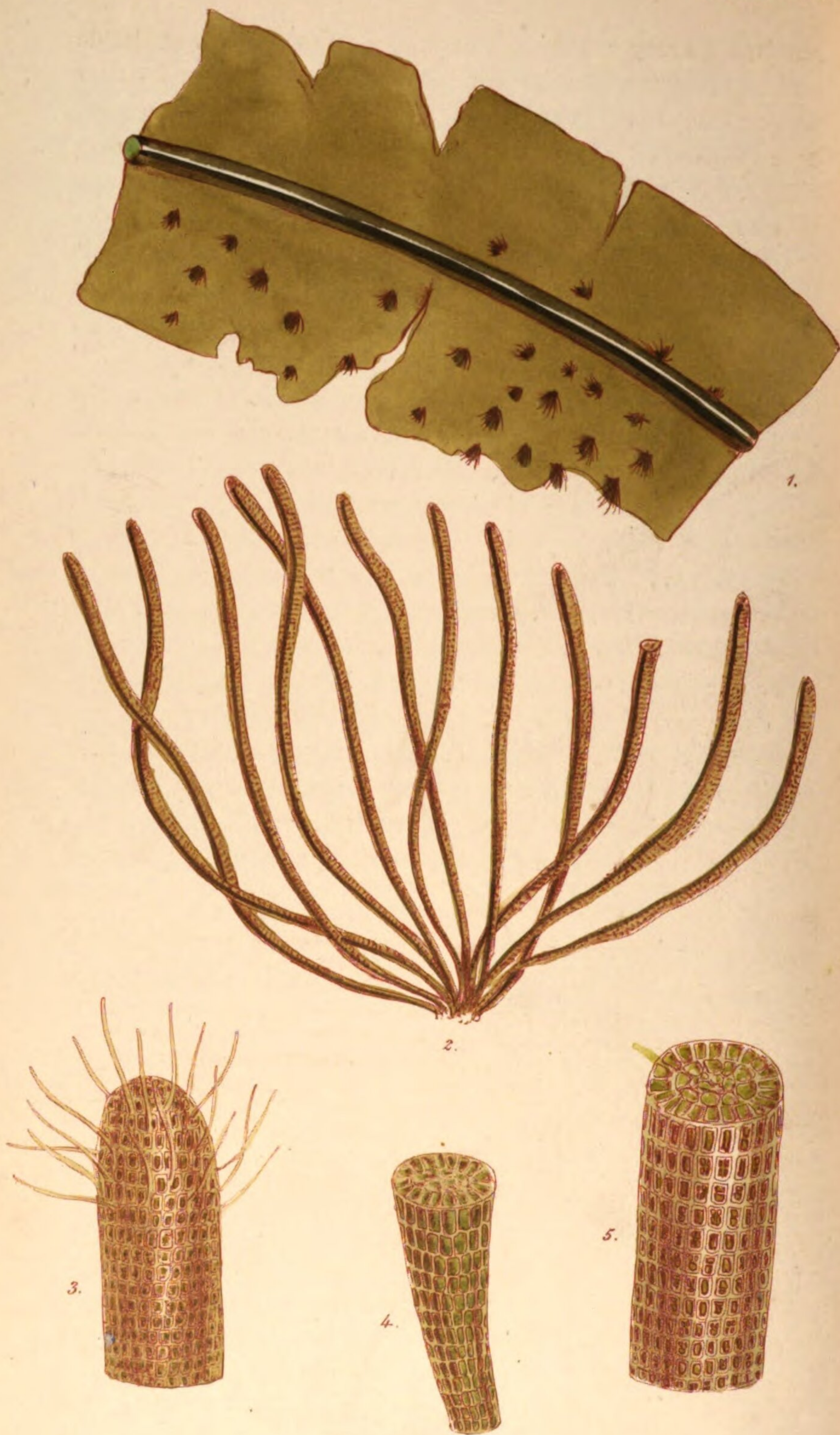


PLATE CCXCV.

LITOSIPHON LAMINARIÆ, Harv.

GEN. CHAR. *Frond* unbranched, cylindrical, filiform, cartilaginous, sub-solid, at length tubular, composed of several rows of cells; the surface areolated. *Fructification* solitary or aggregated, naked *spores*, scattered irregularly over the surface of the frond. LITOSIPHON (*Harv.*),—from *λιτος*, slender, and *σιφων*, a tube.

LITOSIPHON *Laminariæ*; fronds stellately tufted, short, cylindrical, blunt, slightly tapering at the base, smooth (or hairy toward the apex), transversely banded, the bands close together; spores scattered, or several in each transverse band.

LITOSIPHON *Laminariæ*, *Harv. Man.* ed. 2. p. 43.

DESMOTRICHUM *Laminariæ*, *Kütz. Sp. Alg.* p. 470.

CHLOROSIPHON *Laminariæ*, *Harv. in Phyc. Brit.* vol. i. p. x. (*list of species.*)

BANGIA *Laminariæ*, *Lyngb. Hyd. Dan.* p. 84. t. 24. *Ag. Syst.* p. 75. *Hook. Br. Fl.* vol. ii. p. 316. *Harv. in Mack. Fl. Hib.* part 3. p. 241. *Harv. Man.* ed. 1. p. 172.

ASPEROCOCCUS? *Laminariæ*, *J. Ag. Sp. Alg.* vol. i. p. 79.

HAB. Parasitical on the fronds of *Alaria esculenta*, common on that plant in the summer and autumn. Annual.

GEOGR. DISTR. Atlantic shores of Europe.

DESCR. *Fronds* from a quarter to half an inch in length, cylindrical, slightly tapering at the base, then of nearly equal diameter upwards, and ending in a blunt point, smooth, or beset toward the summit with slender pellucid fibres, at first solid, becoming hollow in age from the perishing of the central cells. *Structure* built up of two or three or more layers of concentric cells; those of the outer circle, or periphery, about as long as broad, placed tier above tier in regular circles, so that the frond appears as if transversely striate or banded. The cells sometimes separate into four smaller cells, which occupy the space of one large cell. *Spores*? scattered, one or more in each transverse band, each spore formed from a cell of the band, become enlarged and prominent. *Colour*, when young, a clear olive, becoming brown in age. *Substance* soft, adhering to paper.

This poor little plant has been sadly tossed about among botanists from one part of the system to the other, nor is it yet very certain whether it will be allowed to bear the name under which it is now described, or whether that must be changed into *Desmotrichum*. Should it be found, on comparison, to agree in

structure with the other species so named, our genus *Litosiphon*, which has been formed to include the present plant and the *Asperococcus pusillus*, Carm. (Pl. CCLXX.), must probably be given up. By Kützing these plants are, however, widely separated, *A. pusillus* being associated with the *Chlorosiphon Shuttleworthianus* of that author, a production which I regard as merely the very young state of *Chorda lomentaria*. I cannot consent to separate these parasites, which appear to me to have a close relationship and similar structure.

By its first discoverer our *L. Laminariæ* was placed in *Bangia*, which was then a common receptacle for any filiform plant marked with transverse, closely-set bands of cells. Here for a long time it was suffered to remain unmolested, though almost every author who subsequently described it agreed in pronouncing that it had no natural affinity with the type of the genus *Bangia*, and was even referable to a different *Series* or great division of the Algæ. Still no one, till recently, took any active step in the matter. Many years ago, Mr. David Moore remarked the affinity of *Bangia? Laminariæ* with *Asperococcus pusillus*, and suggested the propriety of forming a genus for their reception, a suggestion which I recorded with approbation in the first edition of the Manual (p. 173), but did not then adopt. Mr. Moore is therefore properly the originator of the present generic group, to which I have now merely given a name.

Fig. 1. Portion of the frond of *Alaria esculenta*, with tufts of LITOSIPHON LAMINARIÆ growing on it:—the natural size. 2. Tuft of fronds. 3. Apex of a frond. 4. Base of the same. 5. Part of the middle portion of the same:—all more or less highly magnified.



PLATE CXI.

CHORDARIA FLAGELLIFORMIS, *Ag.*

GEN. CHAR. *Frond* filiform, much branched, cartilaginous, solid. *Axis* composed of densely packed, longitudinal, interlaced, cylindrical filaments; the periphery, of simple, club-shaped, horizontal, whorled filaments, and long, byssoid, gelatinous fibres. *Fructification* obovate spores, seated among the filaments of the periphery. CHORDARIA (*Ag.*),—from *chorda*, a cord.

CHORDARIA *flagelliformis*; frond subsimple, furnished with closely-set, long, simple, filiform branches, ramuli very few or none; filaments of the periphery club-shaped, the terminal cellule large or small.

CHORDARIA *flagelliformis*, *Ag. Syn.* p. 12. *Lyngb. Hyd. Dan.* p. 51. t. 13. *Ag. Sp. Alg.* vol. i. p. 166. *Ag. Syst.* p. 256. *Hook. Fl. Scot.* part 2. p. 98. *Grev. Fl. Edin.* p. 288. *Grev. Alg. Brit.* p. 44. t. 7. *Hook. Fl. Brit.* vol. ii. p. 275. *Harv. in Mack. Fl. Hib.* part 3. p. 183. *Harv. Man.* p. 45. *Wyatt, Alg. Danm.* no. 57. *Kütz. Phyc. Gen.* p. 332. t. 27. f. 3. *Endl. 3rd Suppl.* p. 23.

GIGARTINA *flagelliformis*, *Lamour. Ess.* p. 48.

FUCUS *flagelliformis*, *Fl. Dan.* t. 650. *Turn. Syn.* vol. ii. p. 335. *Turn. Hist.* t. 85. *Sm. E. Bot.* t. 1222.

HAB. On rocks and stones in the sea, between tide-marks. Annual. Summer. Common on the shores of the British Islands.

GEOGR. DISTR. Abundant on the Atlantic shores of Europe, from Iceland to France. Eastern coast of North America. Cape of Good Hope.

DESCR. *Root* a minute disc. *Fronds* tufted, from six inches to two or three feet in length, preserving throughout an uniform thickness, of about half a line, furnished with a simple or sparingly forked stem, which is densely clothed from its base to its summit with lateral branches, which issue at distances varying from a tenth to half an inch. *Branches* from six to twenty inches long, cord-like, perfectly simple, and generally naked; but now and then furnished with a few, filiform, often secund ramuli, widely distant from each other. In the young plant, the branches are very short, the stem often developing to its full extent, while the branches are rudimentary, in which state it may readily pass for a different species. *Spores* abundantly produced in the full-grown plant, formed at the base of the peripheric filaments. The structure of the axis is very dense and firm, composed of closely combined interlacing filaments. The filaments of the periphery vary in form as the plant advances in age; when young, they are club-shaped, but in age more or less capitate. *Colour* very dark brown. *Substance* cartilaginous, with a slimy coat. It closely adheres to paper, which it stains of a rusty colour.

A very common plant in the North Atlantic, but strangely misunderstood by early writers, who confounded it with *Gracilaria confervoides*; a mistake which, with modern microscopes, it would be impossible to fall into. It was first clearly defined as a species, in the 'Flora Danica,' and was afterwards made the type of a distinct genus, which in modern systems, represents a separate family, widely parted from that to which *G. confervoides* belongs. The only resemblance between these plants is, that both have long, and often simple branches. Neither in structure, in substance, or in colour, is there any identity.

The fructification, which was first described by Turner, has been overlooked by many authors, and yet it is not unfrequently produced. I have generally found an abundance of spores in full-grown plants, gathered in the months of July and August. They may most easily be elicited by compressing a small part of a branch between two pieces of glass, and appear to exist in equal numbers in all parts of the plant.

At Plate XVII. we have represented the only other British species of *Chordaria* yet discovered. By comparing the figure now given, with that plate, the differences and resemblances will be readily appreciated. In younger plants of *C. flagelliformis* the filaments of the periphery are exactly club-shaped; in more fully grown individuals, the terminal cellule is larger, and more resembles that of *C. divaricata* than I formerly supposed. But the difference in ramification is so great that there can be no difficulty in discriminating between these species.

Fig. 1. *CHORDARIA FLAGELLIFORMIS*:—*of the natural size.* 2. Part of a cross section of the frond. 3. Longitudinal section of the same. 4. Filaments of the periphery and spore. 5. A spore removed.

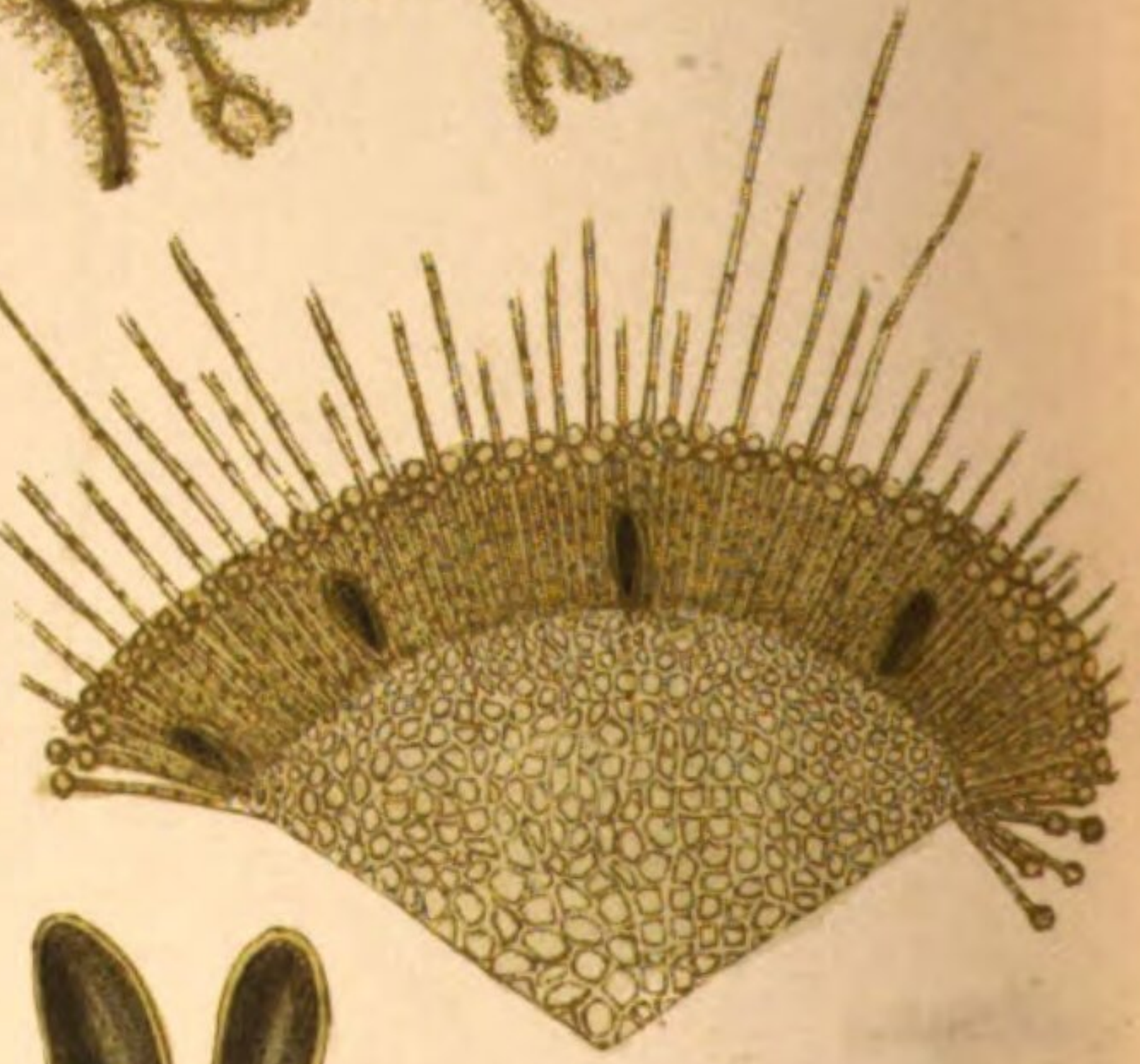
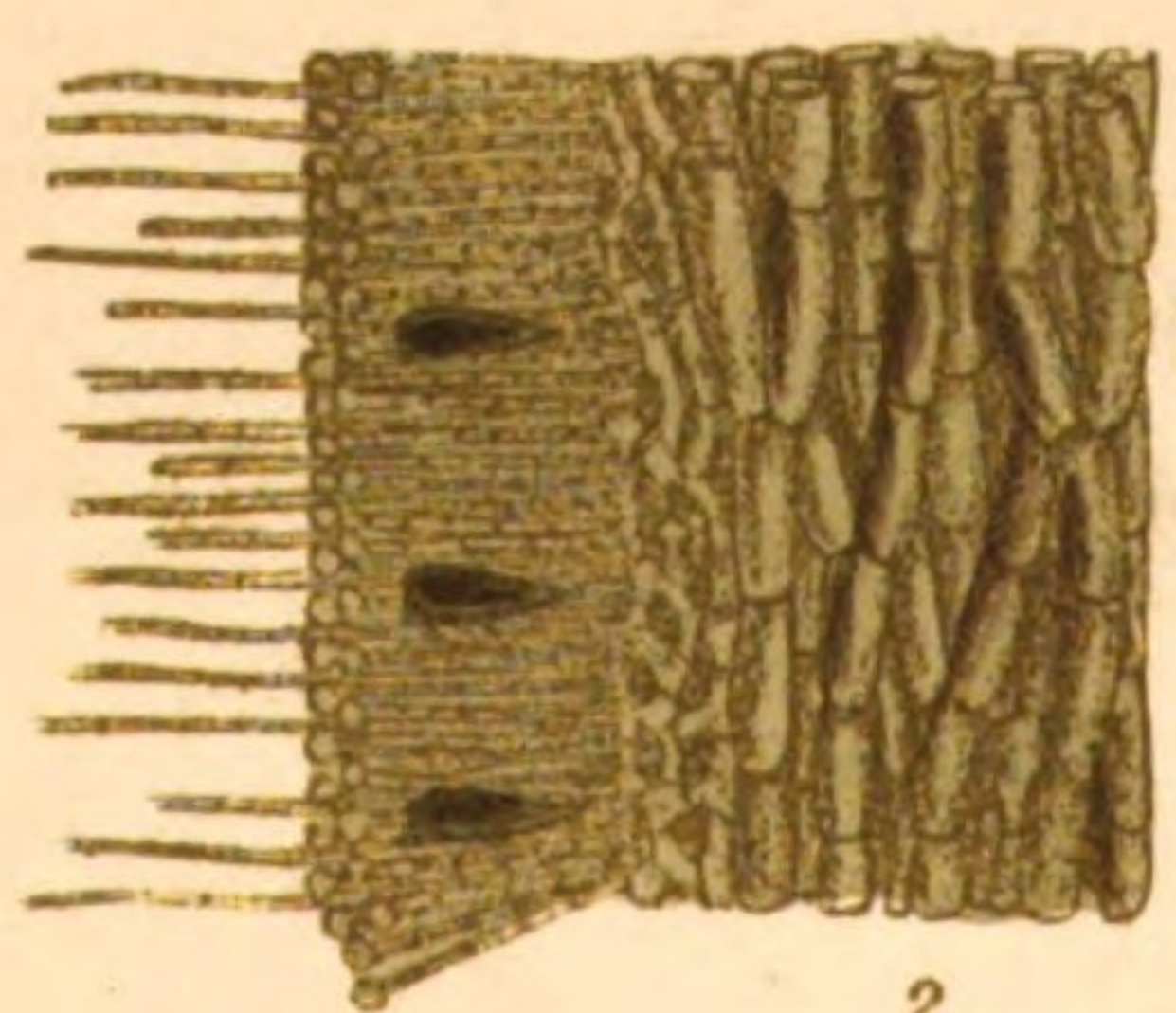
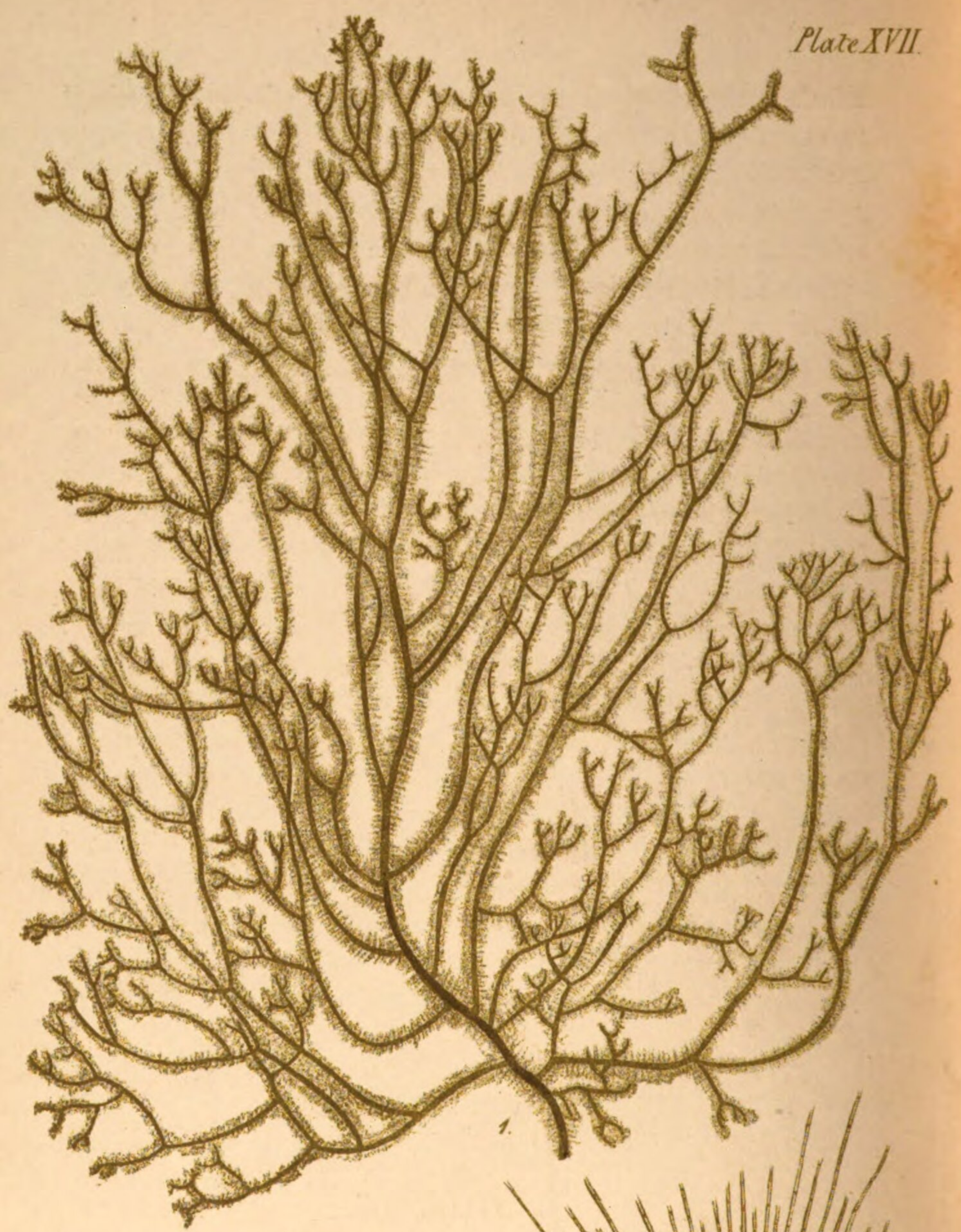


PLATE XVII.

CHORDARIA DIVARICATA, Ag.

GEN. CHAR. *Frond* filiform, much branched, cartilaginous, solid. *Axis* composed of densely packed, longitudinal, interlaced, cylindrical filaments; the *periphery*, of simple, club-shaped, horizontal, whorled filaments, and long, byssoid, gelatinous fibres. *Fructification* obovate spores, seated among the filaments of the periphery. CHORDARIA—from *chorda*, a *cord*; because the branches resemble small cords.

CHORDARIA *divaricata*; frond irregularly divided; branches divaricate, subdichotomous, flexuous, furnished toward the apices with short, very patent, mostly forked ramuli; filaments of the periphery capitate.

CHORDARIA *divaricata*, Ag. *Syn.* p. 12. *Sp. Alg.* vol. i. p. 165. *Syst.* p. 256. *Endl.* 3rd *Suppl.* p. 23.

MESOGLOIA *divaricata*, Kütz. *Phyc. Gen.* p. 332.

HAB. Annual. Autumn. Thrown up from deep water, at Carrickfergus, near Belfast, Mr. Mc'Calla. Oct. 1845.

GEOGR. DISTR. Baltic Sea, Agardh. Belfast Lough.

DESCR. *Frond* 1–3 feet long, not a line in diameter, forming globular tufts, the branches spreading in all directions from a centre; very irregularly divided. Some specimens are nearly dichotomous from the base, with distant forkings, four or five inches asunder, naked, or having a few short ramuli near the tips. Others have a short leading stem, furnished with very numerous, divaricating, lateral, secund or alternate branches, which are more or less regularly dichotomous, and beset with short, patent, forked ramuli. Others again, as our figure represents, have a much longer leading stem, giving birth to excessively numerous branches spreading at right angles, and furnished throughout with equally spreading lesser branches and ramuli. The surface of the whole frond is slimy, and clothed with long, byssoid, gelatinous fibres, which spread in all directions, and, when the plant is floating in the water, add greatly to its apparent diameter. These are imperfectly preserved in a dry state. *Colour* olive, much paler than in *C. flagelliformis*. The filaments composing the periphery are slender, scarcely clavate, the articulations, all but the terminal one, which is very large and globose, being nearly cylindrical. *Spores* affixed to the bases of the filaments of the periphery, obovate, bright olive, plentiful on our specimens.

Chordaria divaricata was first described by the elder Agardh in 1817, and until its recent discovery on the Irish coast was only known to inhabit the Baltic Sea, and even there was considered a rarity. Mr. Mc'Calla to whom we owe the Irish locality, found it thrown up in great plenty, last October, along the shores of

Belfast Lough, the habitat extending seemingly for miles. Baltic specimens, as described by Agardh, are only a few inches in length; and such are some that I owe to the kindness of Dr. Areschoug, of Gottenburg. Our Irish plants, on the contrary, are comparatively *giants*; the tufts being often two or three feet in diameter. I have been forced to select a small one for illustration, but the character of larger plants is very similar. In all respects, except luxuriance, the Irish and Baltic plants are identical.

The *branching* is sufficiently unlike that of *C. flagelliformis*, resembling much more closely that of *Stilophora rhizodes*, to which outwardly our plant bears a very great resemblance. But besides a difference in habit, it is well distinguished from *C. flagelliformis* by the shape of the filaments of the periphery which in that species are club-shaped, while in this they are slender, but terminated by a large globular cellule. In this respect there is a resemblance to a *Mesogloia*, but the structure of the axis is exactly that of *Chordaria*.

Fig. 1. CHORDARIA DIVARICATA:—*natural size*. 2. Longitudinal section of the frond, showing part of the axis. 3. Transverse section of ditto. 4. Filaments of the periphery, and a spore. 5. Spores removed:—all *more or less magnified*.

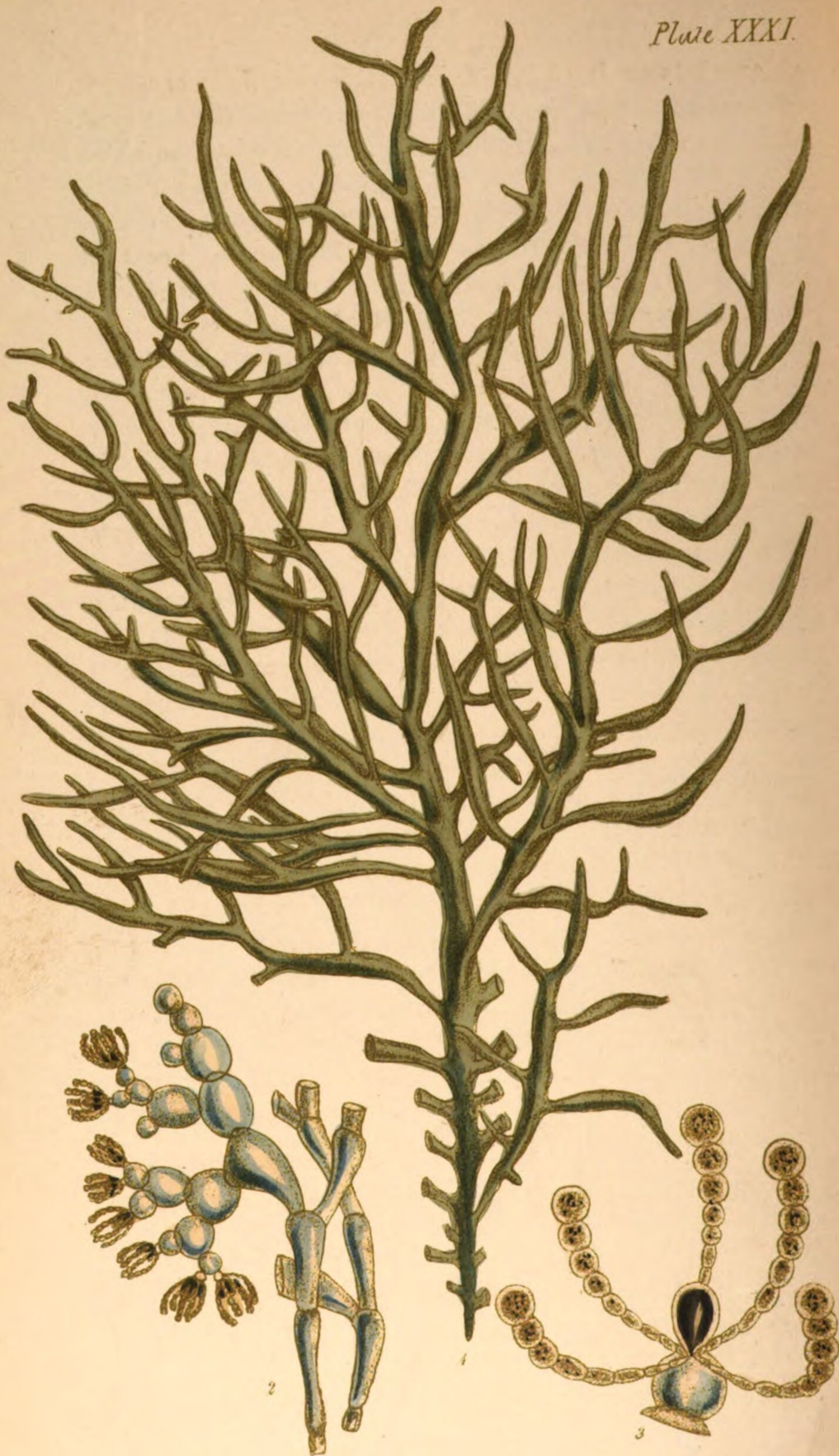


PLATE XXXI.

MESOGLOIA VERMICULARIS, Ag.

GEN. CHAR. *Frond* filiform, much branched, gelatinous. *Axis* composed of loosely packed, longitudinal, interlaced filaments, invested with gelatine; the *periphery* of radiating, dichotomous filaments, whose apices produce clusters of club-shaped, moniliform fibres. *Fructification*, obovate spores, seated among the apical fibres.—MESOGLOIA (Ag.), from μέσος, the *middle*; and γλοιος, *viscid*; in allusion to the gelatinous axis.

MESOGLOIA *vermicularis*; frond unequally distended, clumsy; branches irregularly pinnate, thick, worm-like, lineari-fusiform; ramuli copious, long, flexuous, resembling the main branches.

MESOGLOIA *vermicularis*, Ag. *Syn.* p. 126. *Lyngb. Hyd.* p. 190. t. 65. Ag. *Syst.* p. 51. *Harv. in Hook. Br. Fl.* vol. ii. p. 387. *Wyatt. Alg. Danm.* no. 100. *Kütz. Phyc. Gen.* p. 332. t. 27. f. 1. *Menegh. Alg. Ital. et Dalm.* p. 279. *Endl. 3rd Suppl.* p. 23.

TRICHOCLADIA *vermicularis*, *Harv. in Mac. Fl. Hib.* part 3. p. 186.

HELMINTHOCLADIA *vermicularis*, *Harv. Gen. S. A. Pl.* p. 397. *Harv. Man.* p. 45.

RIVULARIA *vermiculata*, *E. Bot.* t. 1818.

CHÆTOPHORA *vermiculata*, *Hook. Fl. Scot.* part 2. p. 75.

HAB. On rocks and stones in the sea, about half-tide level. Annual. Summer. Common.

GEOGR. DISTR. Atlantic shores of Europe. Mediterranean sea.

DESCR. *Root* small, discoid. *Fronds* tufted, 1–2 feet high, gelatinous, flaccid, but elastic, with a leading stem, which is either simple, or but slightly divided, somewhat flexuous, unequally distended and constricted at intervals, tapering to the base and apex, and beset throughout its length with very numerous, close, lateral branches. *Branches* similar in form to the stem, of various length, patent, or horizontal, more or less clearly pinnate, or furnished with alternate subdistichous or quadrifarious lesser branches, mixed with short tooth-like ramuli. *Stem* and main *branches* clumsy, from two to five lines or more in diameter, more coriaceous than others of the genus. *Ultimate* branches simple or forked, tapering to an obtuse point; all the axils rounded. *Filaments* of the axis loosely interwoven; their joints pear-shaped or cylindrical:—those of the periphery dichotomous, with globular joints; ultimate fibres about five in a cluster, their joints gradually larger from the base upwards, containing granular matter. *Spores* elliptical-obovate, sessile. *Colour* muddy olive, yellowish, or brown.

This species, the best known and earliest described of the genus, as now restricted, appears to have been first noticed by

Dr. Drummond, who discovered it cast on shore at Larne, in August, 1806 ;—unless, as Dr. Arnott supposes, it be the *Ulva rubens* of Hudson, a synonyme which I think better referable to *Dudresnaia divaricata*.

It is common on many parts of the coasts of England, Scotland, and Ireland, and is found in the Isle of Jersey by Miss White ; but appears to be, in some districts, less common than *M. virescens*. This, Mr. Ralfs remarks, is the case about Penzance, in Cornwall, and on the Welsh Coast. It is frequent in Torbay, and in other localities of the south of England ; and very abundant on the west and south-west coasts of Ireland. In the north-east of Ireland, where it was first noticed, Mr. Thompson finds it in profusion, and has observed, among heaps of seaweed cast on shore “the partiality of the *Idotea æstrum*, Leach, for the gelatinous *Mesogloia vermicularis*, plants of which it had very much eaten, leaving the other Algæ, of which there were many species in the heap quite untouched.”

I have given the Mediterranean station on the authority of Professor Meneghini, who has received it from Venice and from Trieste. It is omitted by Agardh in his *Algæ Mediterraneæ*.

M. vermicularis may be considered the type of the genus *Mesogloia*, as now defined by J. Agardh, consisting of that portion of the older genus to which I formerly applied the name of *Trichocladia*, subsequently changed into *Helminthocladia*. When I proposed *M. multifida* of Agardh, as the type of the restricted genus *Mesogloia*, I was not aware that that species is identical in structure with *Nemaleon* of Tozzetti. To *Nemaleon*, *M. multifida* is therefore now referred ; *M. Hudsoni* (of British authors) and *M. coccinea* to *Dudresnaia* ; and *M. moniliformis*, Griff. to *Crouania*. Respecting the proper place of *M. purpurea*, Harv. I am at present doubtful.

Fig. 1. MESOGLOIA VERMICULARIS, (small specimen):—*natural size*. 2. Portion of the filaments, axial and peripheral, of which the frond is composed. 3. Apex, with its *spore*, and cluster of ultimate fibres :—*magnified*.

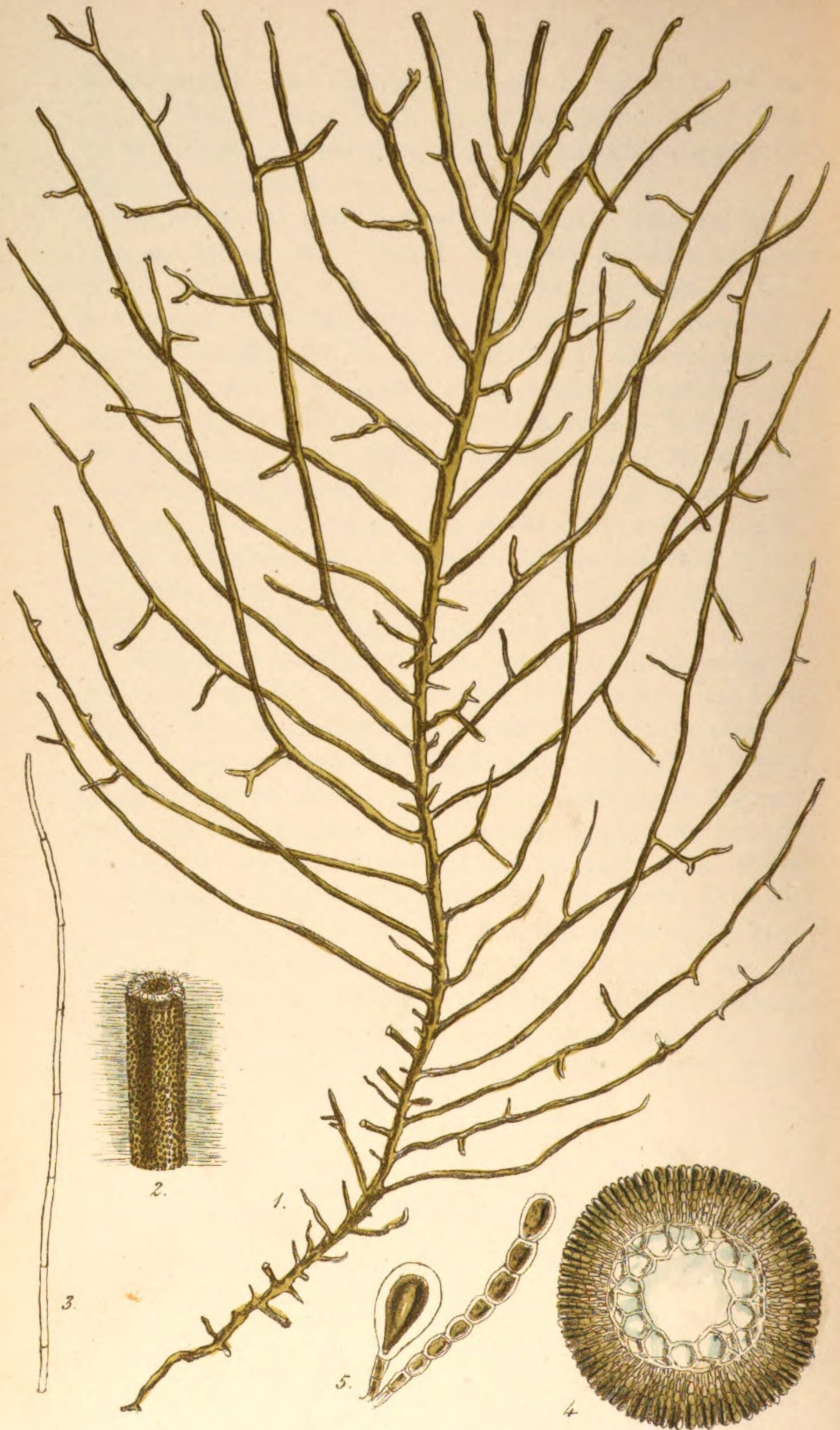


PLATE CCCXVIII.

MESOGLOIA GRIFFITHSIANA, *Grev.*

GEN. CHAR. *Frond* filiform, much branched, gelatinous; the axis composed of longitudinal, subsimple, interlacing fibres, invested with gelatine; the periphery formed of radiating, dichotomous, coloured filaments. *Fructification*: ovate or elliptical, olivaceous spores, attached to the filaments of the periphery. MESOGLOIA (*Ag.*),—from μέσος, *the middle*, and γλοιος, *viscid*; from the gelatinous axis.

MESOGLOIA *Griffithsiana*; frond slender, equal throughout; branches alternate or irregular, filiform, long, simple, nearly bare of ramuli.

MESOGLOIA *Griffithsiana*, *Grev. MS.* *Hook. Br. Fl.* vol. ii. p. 387. *Wyatt, Alg. Danm.* no. 48. *Harv. Man.* ed. 2. p. 47. *Kütz. Sp. Alg.* p. 545.

HAB. In rock-pools between tide-marks, rare. Annual. Summer. Livermead, Torbay, *Mrs. Griffiths*. Sidmouth, *Miss Cutler*. Roundstone, *Mr. M'Calla*.

GEOGR. DISTR. Atlantic shores of Europe.

DESCR. *Root* a small disc. *Fronds* growing in tufts, filiform, about a line in diameter, and from twelve to eighteen inches in length, with a percurrent, undivided stem, set throughout with long, spreading, slender branches, which are mostly simple and often naked, or having a very few spreading or divaricating branchlets scattered at irregular intervals. When the plant is in a growing state it is clothed with colourless, horizontal fibres, spreading from every portion of the stem and branches, and making them look, when seen under water, of much greater diameter than they really are. In age the axis decays, and the branches become hollow. The filaments of the periphery are closely set, club-shaped, and beautifully beaded. The spores are obovate, and raised in short pedicels. *Colour* a rather pale olive-green, becoming greener in fresh water. *Substance* gelatinous, flaccid, slippery. In drying, the frond shrinks considerably, and adheres closely to paper.

This species bears a striking resemblance in its ramification to *Chordaria flagelliformis*, but is always of a much paler colour, and the microscopic structure very different; the axis being much less dense, and the substance more gelatinous and tender. Still there is a considerable similarity in structure, and evidently an affinity, through this species, between the two genera.

M. Griffithsiana worthily bears the name of its discoverer, so

often mentioned in the pages of this work, who has added so many original observations on the British Algæ to the common stock, and has been the first to notice so many new species. More recently this plant has been gathered on the shores of Heligoland in the Baltic, and also on the northern coasts of France. It is nowhere very common.

Fig. 1. MESOGLOIA GRIFFITHSIANA :—*the natural size*. 2. A portion of a branch :—*slightly magnified*. 3. One of the colourless fibres. 4. Transverse section of the stem. 5. A spore and one of the filaments of the periphery :—*all more or less highly magnified*.

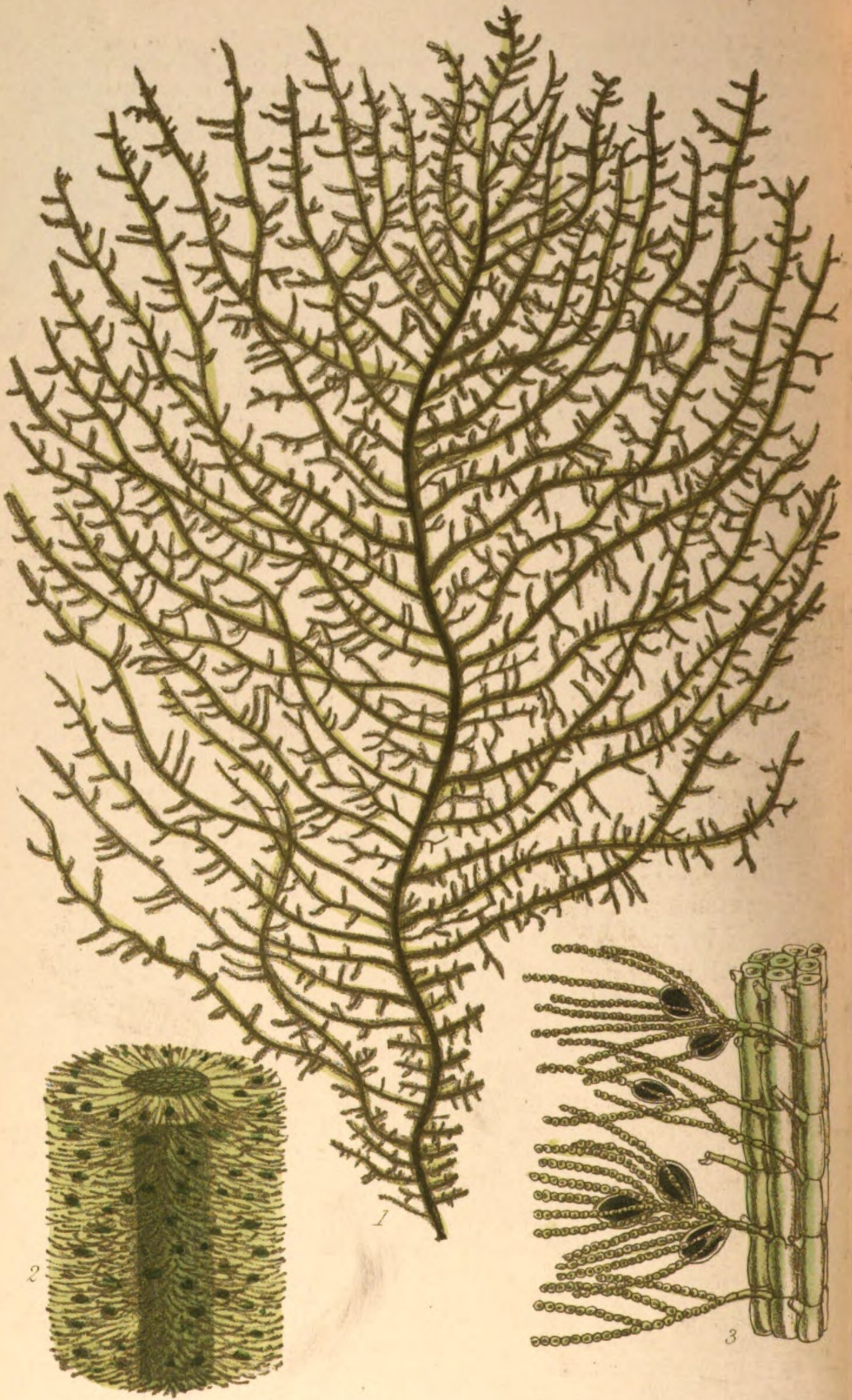


PLATE LXXXII.

MESOGLOIA VIRESCENS, *Carm.*

GEN. CHAR. *Frond* filiform, much branched, gelatinous. *Axis* composed of loosely packed, longitudinal, interlaced filaments, invested with gelatine; the *periphery* of radiating, dichotomous filaments whose apices produce clusters of club-shaped, moniliform fibres. *Fructification*, obovate spores, seated among the apical fibres. MESOGLOIA (*Ag.*) from μέσος, the *middle*; and γλοιός, *viscid*; in allusion to the gelatinous axis.

MESOGLOIA *virescens*; frond filiform, gelatinous; branches long, slender, villous; ramuli numerous, patent, short, linear, obtuse.

MESOGLOIA *virescens*, *Carm. Alg. Appin. ined. Hook. Br. Fl.* vol. ii. p. 387. *Wyatt, Alg. Danm.* no. 49. *Berk. Gl. Alg. t.* 17. f. 2.

MESOGLOIA *affinis*, *Berk. Gl. Alg. t.* 16. f. 2.

MESOGLOIA *Hornemanni*, *Suhr.?* *Kütz. Phyc. Gen.* p. 332?

TRICHOLADIA *virescens*, *Harv. in Mack. Fl. Hib.* part 3. p. 184.

HELMINTHOCLADIA *virescens*, *Harv. Man.* p. 46.

β, *Zostericola*; frond brownish, simple, with a few short branches.

MESOGLOIA *gracilis*, *Carm. Alg. Appin. ined. Berk. Gl. Alg. t.* 17. f. 1. *Endl. 3rd Suppl.* p. 23.

MESOGLOIA *Zosteræ*, *Aresch.*

RIVULARIA *Zosteræ*, *Mohr. in Weber. Beitr.* vol. ii. p. 367. *Lyngb. Hyd. Dan.* p. 194. t. 66.

HAB. On rocks, stones, and Algæ, at half-tide level. Annual. Spring and Summer. Common. West of Scotland, *Carmichael, Rev. D. Landsborough, &c.* North of Ireland, *Mr. W. Thompson.* West, south, and east of Ireland, abundant. South coast of England, *Mrs. Griffiths, &c.* β, parasitical on *Zostera*, at Appin, *Capt. Carmichael.* Roundstone Bay, *Mr. Mc'Calla.*

GEOGR. DISTR. Northern shores of Europe. Baltic Sea. Atlantic coasts of France.

DESCR. *Root* scutate. *Frond* from four to twelve or fourteen inches in length, and from half to nearly a line in diameter, cylindrical, filiform, equal in diameter throughout its extent, with an undivided stem, densely clothed with lateral branches. *Branches* issuing at short distances from each other, sometimes as long as the stem, sometimes half as long, and in var. β. very short, patent, resembling the main stem, and like it having numerous, lateral, simple or forked, patent secondary branches. Every part of the frond appearing villous to the naked eye from the great length, and little density of the stratum of filaments, which form the periphery. These *filaments* are irregularly dichotomous or somewhat fascicled; their divisions moniliform,

and of equal diameter throughout. *Colour* a yellowish or greenish olive. *Substance* tender, gelatinous and slippery. *Fructification*, elliptical spores attached to the bases of the filaments of the periphery. Our variety, β , regarded by some authors as a distinct species, only differs in being of smaller size, with less compound ramification; there is no microscopic character to distinguish it.

An abundant species, on all our coasts, from the north of Scotland to Cornwall, and subject to little variation except in the amount of its ramification. Sometimes the branches are even more densely set than our figure represents; often they are more distant, and occasionally the frond is very much less divided. In the variety β . especially, which grows on the leaves of the *Zostera*, the main stem seldom exceeds three or four inches in length, and its branches are frequently rudimentary. I do not think, however, that it has sufficient characters to found a species upon.

The appearance of a branch of this species under the microscope is very beautiful, owing to the great length, and full greenish olive hue of the filaments composing the periphery, which are set in a looser gelatine than in any other of our British kinds, and give the frond a singularly villous appearance, to the naked eye. In this respect it differs from *M. Griffithsiana* which is of a much, firmer and more compact substance.

The *Mesogloia affinis*, of Berkeley, would appear, by the figure and description, to be only the young of *M. virescens*; and though I have not seen *M. Hornemanni*, Suhr., yet the description given of it by Kützing, accords so well with specimens of *M. virescens*, communicated to me by Senator Binder, of Hamburg, from Heligoland, that I have no hesitation in considering it a synonyme.

Fig. 1. MESOGLOIA VIRESCENS :—*of the natural size*. 2. Portion of the frond :—*slightly magnified*. 3. Filaments of the periphery, and some of those of the axis :—*highly magnified*.

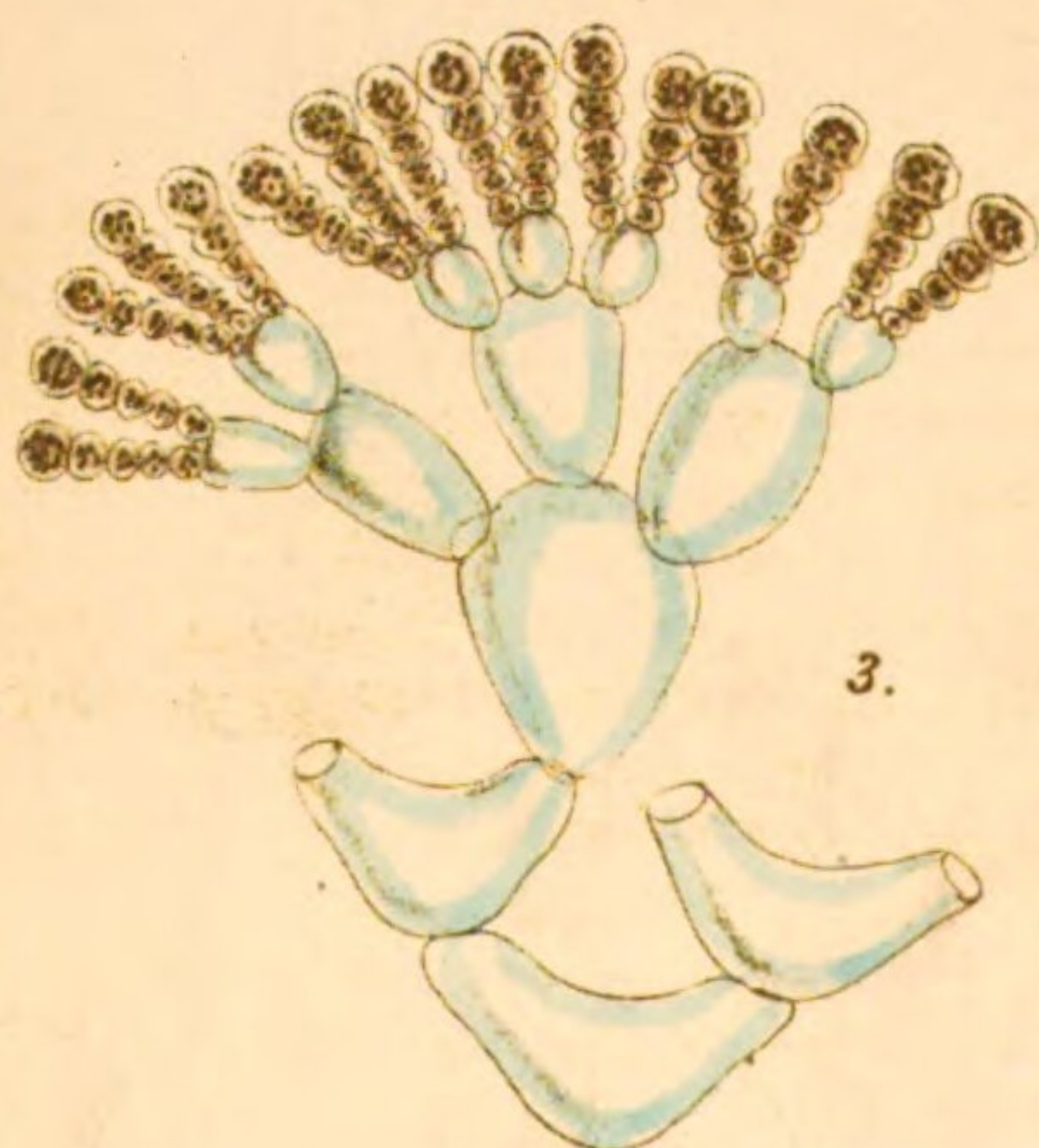
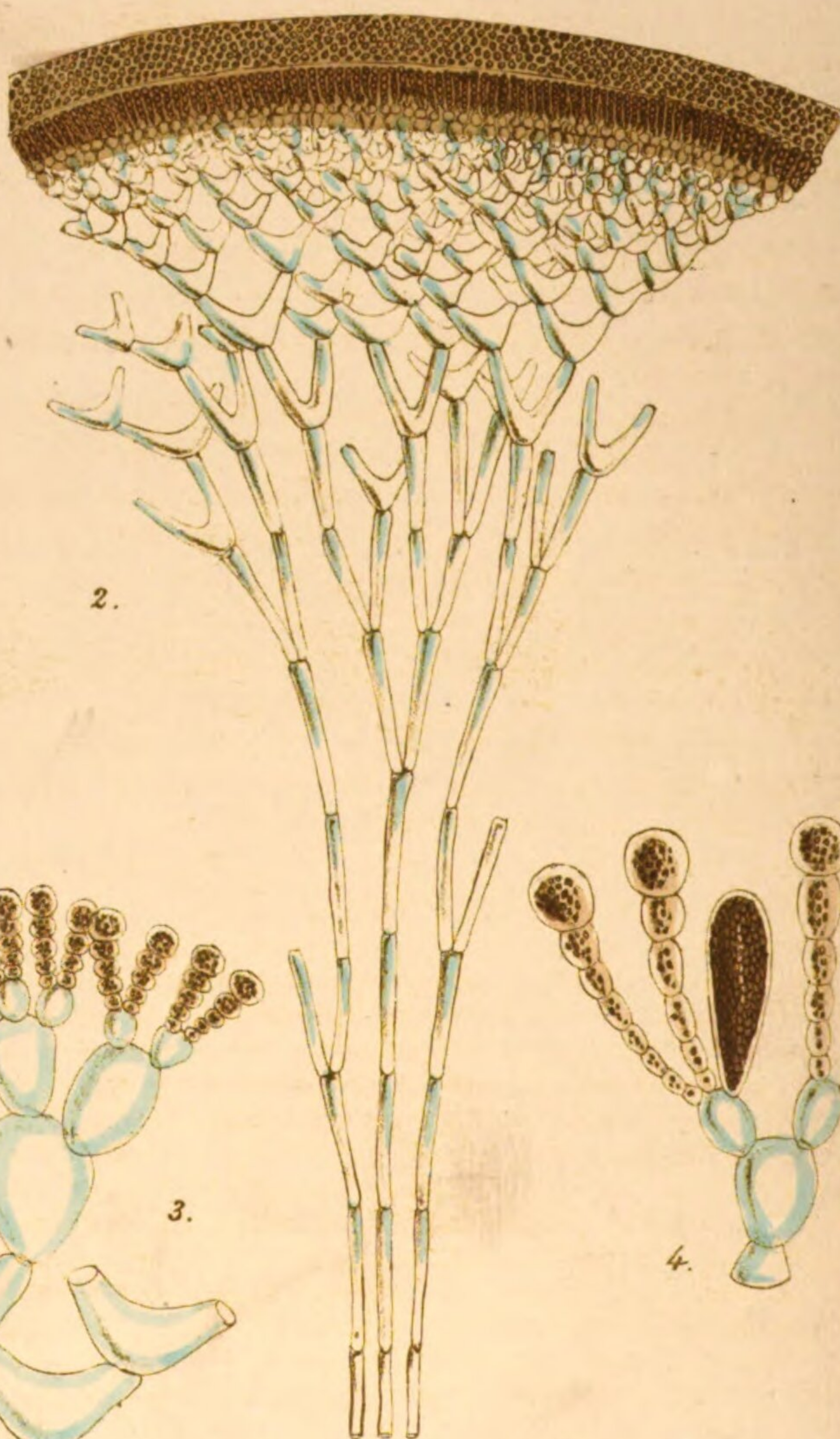


PLATE CCCXXIV.

LEATHESIA TUBERIFORMIS, *S. F. Gray.*

GEN. CHAR. *Frond* globose or lobed, fleshy, composed of jointed, colourless, dichotomous filaments, issuing from a central point; their apices, which constitute a fleshy coating to the frond, coloured and tufted. *Fructification*, oval or pyriform *spores*, concealed among the coloured apical filaments. LEATHESIA (*S. F. Gray*),—in honour of the Rev. G. R. Leathes, a British naturalist; and who first communicated this plant to Sir J. E. Smith.

LEATHESIA *tuberiformis*; fronds olivaceous, tuberous, when young stuffed with cottony fibres, at length hollow.

LEATHESIA *tuberiformis*, *S. F. Gray*, *Nat. Ar. Br. Pl.* vol. i. p. 301. *Harv. Man.* ed. 2. p. 48.

LEATHESIA *marina*, *Endl.* 3rd *Supp.* p. 23. *Kütz. Sp. Alg.* p. 543. *J. Ag. Sp. Alg.* vol. i. p. 52.

LEATHESIA *difformis*, *Aresch. Enum. Phyc. Scand.* p. 154. t. 9. f. B.

CORYNEPHORA *marina*, *Ag. Syst.* p. 24. *Harv. in Hook. Br. Fl.* vol. ii. p. 390. *Harv. Man.* ed. 1. p. 46. *Wyatt, Alg. Danm.* no. 149. *Græv. Crypt. Scot.* t. 53. *Harv. in Muck. Fl. Hib.* part 3. p. 184.

CHÆTOPHORA *marina*, *Lyngb. Hyd. Dan.* p. 193. t. 66.

NOSTOC *marinum*, *Ag. Disp.* p. 45. *et Syn.* p. 133.

TREMELLA *difformis*, *Linn. Syst. Nat.* p. 714. *Huds. Fl. Ang.* vol. ii. p. 565. *With.* vol. iv. p. 82.

RIVULARIA *tuberiformis*, *E. Bot.* t. 1956.

HAB. Between tide-marks, on rocks, corallines, and the smaller Algæ; very common. Annual. Summer and autumn.

GEOGR. DISTR. Atlantic shores of Europe. Baltic Sea. East coast of North America. Cape of Good Hope, common, *W. H. H.*

DESC. *Fronds* when growing on Algæ scattered or solitary, when on rocks usually heaped together and much crowded, forming wide-spreading tuberculated masses, very variable in size, from that of a pea to that of a large walnut. When young, the interior of the tuberous frond is stuffed with weak, empty, dichotomous, cobweb-like fibres, rising from the base and radiating in all directions, but as the outer wall extends, these gradually perish, and the plant becomes a hollow ball. The lowermost cells of the cobwebby fibres are very long and slender; the upper ones become gradually shorter and wider, and are two-horned, or somewhat half-moon-shaped, a new cell springing from each cusp; those which adjoin to the outer wall are small and globose. The outer wall is formed of closely-packed, moniliform, club-shaped, vertical filaments, lying in a transparent jelly; each filament formed of several spherical cells containing olive granules. *Spores* pyriform, sunk among the club-shaped peripheric filaments, with

which they appear to be homologous. *Colour* a brownish olive. *Substance* cartilaginous. In drying this plant shrinks considerably, and closely adheres to paper if pressed.

Common on all our rocky shores, first appearing about April or May in the form of little, pea-like buttons, attached to small Algæ, or grouped in clusters on the surface of rocks and coral-lines, and, as the season advances, gradually acquiring size; the fronds becoming hollow and cohering in masses. In its young state it constitutes, according to Areschoug, the *Corynophlæa baltica* of Kützing. Not having seen any specimen of the plant so named, I am unable to decide the question.

By most continental authors the specific name *marina* is adopted for this plant, a name which I find for the first time in Agardh's *Dispositio Algarum Sueciæ*, published in 1811. Areschoug alone adheres to the older Linnæan name *difformis*, and if either of these be adopted, the latter is surely preferable, not merely from its elder birth, but because it expresses a natural character of this *deformed*-looking or double-faced plant, while *marina* applies alike to every species of the genus, and even of the family (*Chordarieæ*) to which it belongs:—so that one might as well talk of a *marine sea-weed* as of a *marine Leathesia*. I adopt the name selected by the founder of the genus, and which dates from 1809 (*E. Bot.* t. 1956), because it well expresses the aspect of the plant,—“like a cluster of small potatoes,”—and is at least two years older than *marina*. It is strange that Sir J. E. Smith should have overlooked the *Tremella difformis* of Linnæus, if that plant were rightly taken up by Hudson and Lightfoot.

Fig. 1. LEATHESIA TUBERIFORMIS, in various stages:—*the natural size*.
2. Portion of a longitudinal slice, showing the dense coloured outer wall, or crust, and some of the cobwebby fibres. 3. Apices of the cobwebby fibres, and some of the club-shaped filaments. 4. Some of the same, with spores:—*all more or less highly magnified*.

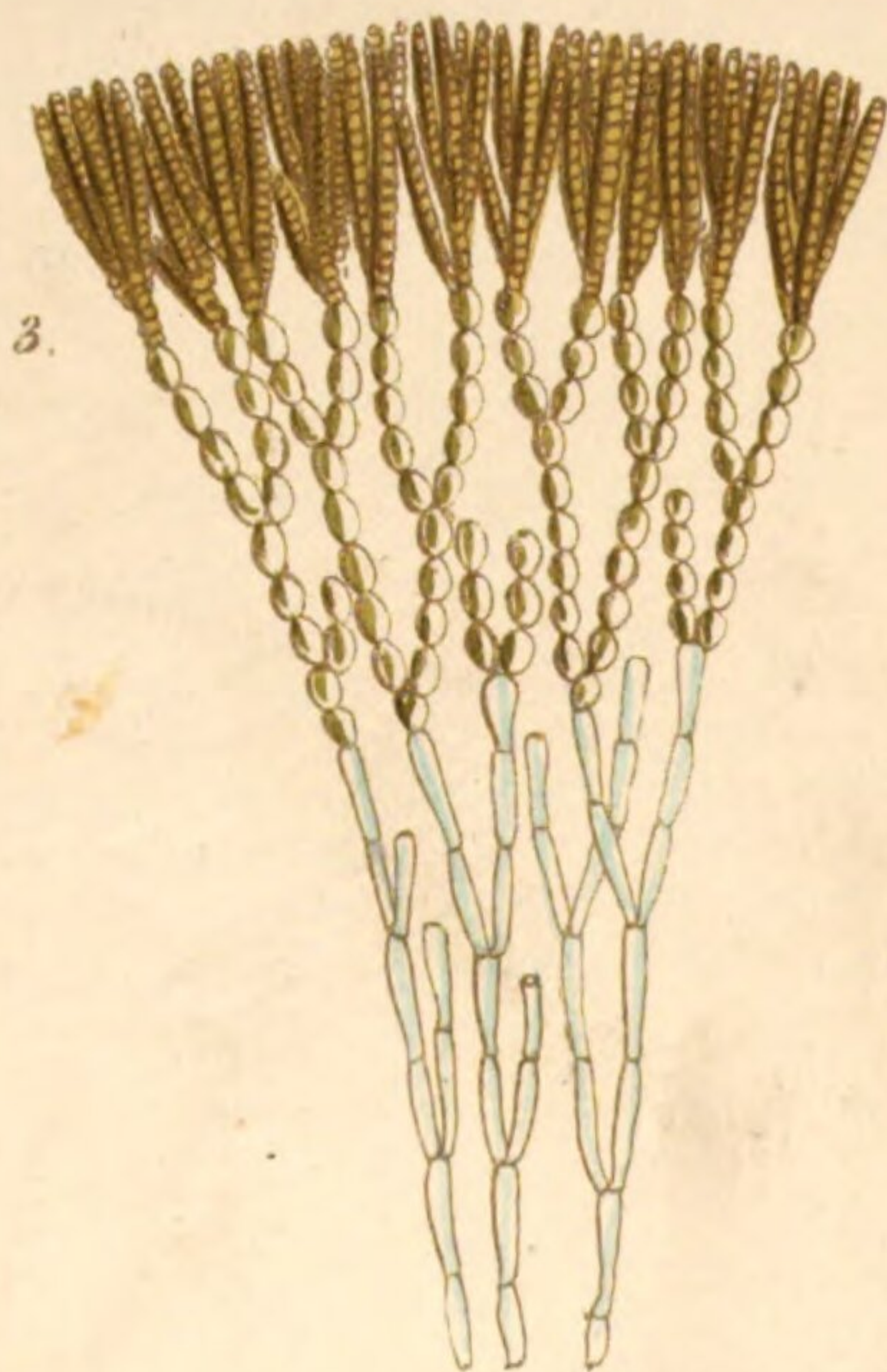
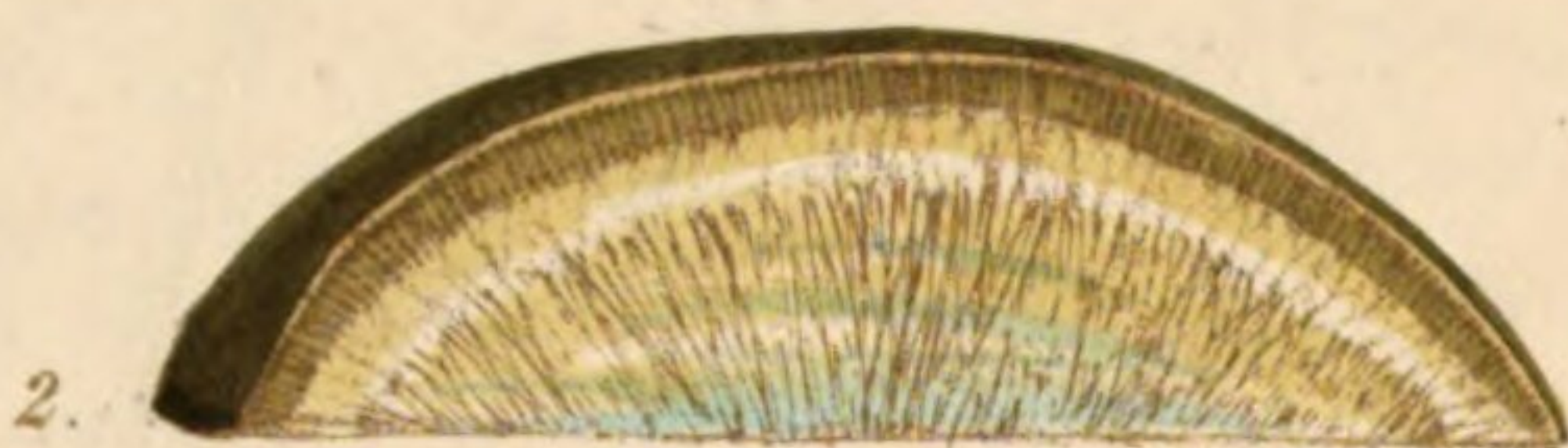


PLATE CLXXVI.

LEATHESIA BERKELEYI, *Harv.*

GEN. CHAR. *Frond* globose or lobed, fleshy, composed of jointed, colourless, dichotomous filaments, issuing from a central point; their apices, which constitute a fleshy coating to the frond, coloured and tufted. *Fructification*; oval *spores*, attached to the coloured tips of the filaments. LEATHESIA (*Gray*),—in honour of the Rev. Mr. Leathes, a British naturalist.

LEATHESIA *Berkeleyi*: fronds dark brown, depressed, fleshy, solid; filaments densely packed.

CHÆTOPHORA *Berkeleyi*, *Grev. in Berk. Gl. Alg.* t. 1. fig. 2. *Harv. in Hook. Br. Fl.* vol. ii. p. 390. *Wyatt, Alg. Danm.* no. 231. *Harv. Man.* p. 123.

HAB. On submarine rocks, between tide marks; exposed at low water. Annual. Summer. Torquay, *Rev. M. J. Berkeley*. Tor Abbey rocks, *Mrs. Wyatt*. Rocks at Kilkee, Co. Clare (1833); Miltown Malbay; and Valentia, Kerry, *W. H. H.*

GEOGR. DISTR. South of England and West of Ireland.

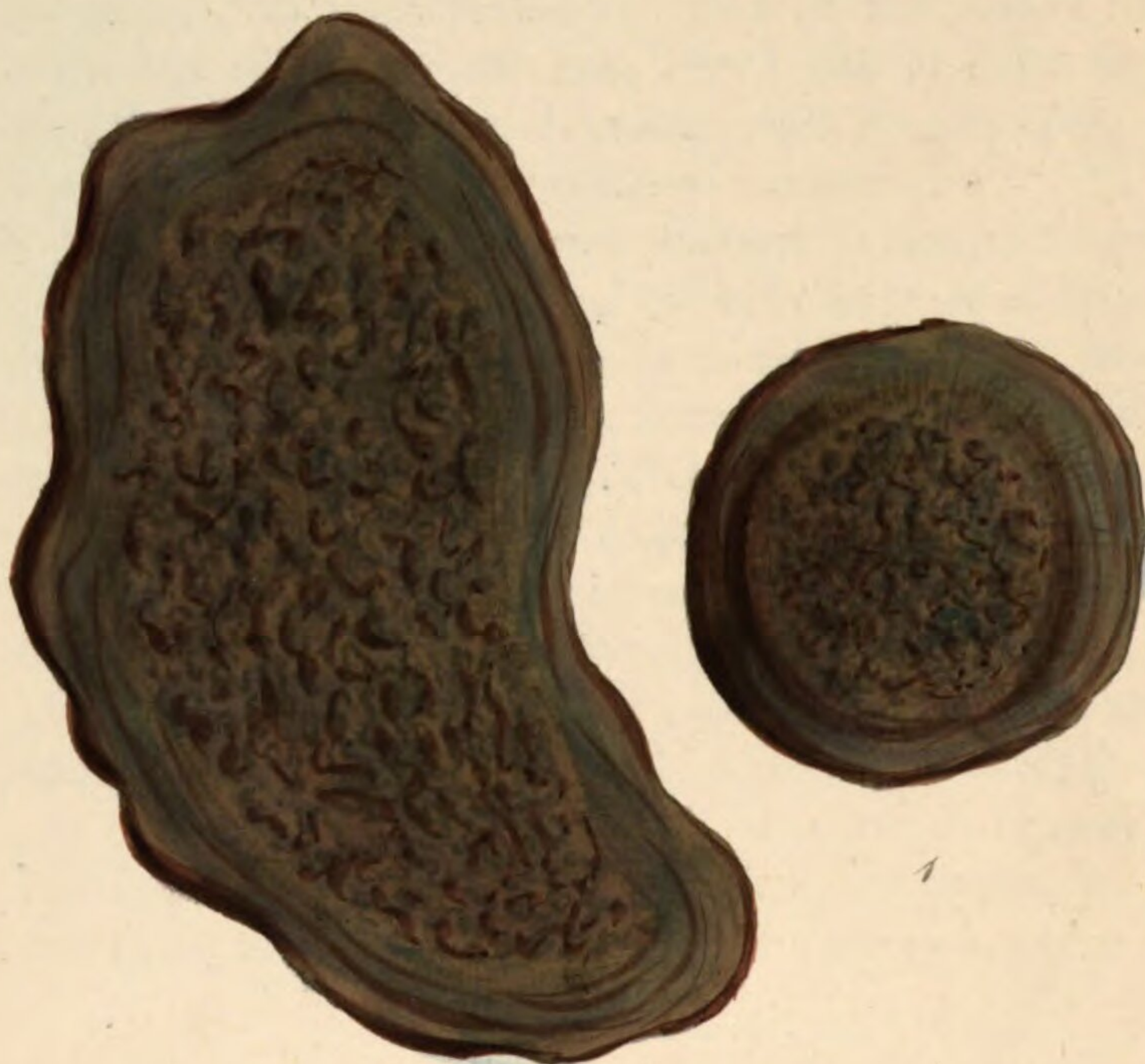
DESCR. *Fronds* gregarious, one or two inches in diameter, from a quarter to half an inch in thickness, convex, but depressed, irregular in form, dark brown, fleshy, soft, somewhat elastic, not gelatinous to the touch, *solid* at all periods of its growth. *Filaments* very densely packed, dichotomous, composed of three kinds of cells; the cells of the lower part cylindrical or slightly pyriform, several times longer than their diameter; those of the middle portion bead-like, oval, partially coloured; those of the terminal branchlets, which are irregularly branched and densely compacted together, very short and full of dark-olive endochrome. *Fruit* unknown. In drying, the plant shrinks considerably, and partially adheres to paper.

A small plant, more curious than beautiful, first noticed by the Rev. M. J. Berkeley on rocks at Torquay, from which locality I have received specimens gathered by Mrs. Griffiths and Mrs. Wyatt. On the west coast of Ireland it is plentiful in several places and probably is pretty generally distributed along our shores, being overlooked on account of its being often nearly of the colour of the rock on which it grows, and resembling, in its fleshy appearance and feel, the collapsed body of the common *Actinia*. The Irish specimens (from which, in a living state, our figure is taken) appear to be identical with those published by Mrs. Wyatt, and agree very well with the description of the

plant given by Mr. Berkeley, so far as outward resemblance may be trusted. But the magnified figure of that author is very unlike that now given ; nor have I been able to detect the long diaphanous points to the filaments which he describes. Still I am inclined to regard our plants as identical.

From the common *Leathesia tuberiformis* (*Corynephora marina*, Ag. and Brit. Fl.), *L. Berkeleyi* differs in being at all times of a dense and solid substance (not, as *L. tuberiformis*, at first flocculent within, and then hollow), in its different colour, and more depressed form. In all the essential characters, if my analysis, made from the recent plant, may be depended on, the two plants agree in structure. I therefore remove *L. Berkeleyi*, which was at first placed in *Chætophora*, to the present genus. The name *Corynephora* under which these plants have been hitherto known to British botanists must be laid aside, being too like, both in sound and sense, to *Corynephorus*, Palis., a genus of Grasses ; and that now revived was proposed for the typical species in 1821, three years earlier than Agardh applied *Corynephora* to it.

Fig. LEATHESIA BERKELEYI ; cluster of fronds :—*of the natural size*. 2. Vertical section of a frond :—*moderately magnified*. 3. Some of the filaments of which it is composed :—*highly magnified*.



1



2



3



4



5

PLATE XCVIII.

RALFSIA DEUSTA, Berk.

GEN. CHAR. *Frond* coriaceo-crustaceous, fixed by its inferior surface, orbicular, concentrically zoned; composed of densely packed, vertical, simple filaments. *Fructification*; depressed warts, scattered over the upper surface, containing obovate spores fixed to the bases of vertical filaments. RALFSIA (Berk.),—in honour of John Ralfs, Esq., of Penzance, a most acute and accurate botanist, whose discoveries among the minute Algæ, especially the *Diatomaceæ*, have thrown great light on that little known branch of botany.

RALFSIA deusta.

RALFSIA deusta, Berk. in Eng. Bot. Suppl. t. 2866.

HILDENBRANDTIA rubra, Endl. 3rd Suppl. p. 26 (nec. syn. Berk.; nec. Menegh.).

CRUORIA verrucosa, Aresch.

PADINA? deusta, Hook. Br. Fl. vol. ii. p. 281. Harv. in Mack. Fl. Hib. part 3. p. 178. Harv. Man. p. 31.

ZONARIA? deusta, Ag. Syn. p. 40. Ag. Sp. Alg. vol. i. p. 132. Ag. Syst. p. 265. Lyngb. Hyd. Dan. p. 19. t. 5.

FUCUS fungularis, Oeder. Fl. Norv. vol. ii. p. 107. Fl. Dan. t. 420 (excl. syn. Imperati.).

HAB. Common on the rocky shores of the British Islands, between high-water mark, and half-tide level; from Orkney to Devonshire. Perennial. Winter.

GEOGR. DISTR. Atlantic shores of Europe from Iceland to France. Baltic Sea, Aresch. Kamtschatka and Unalascha, Tilesius.

DESCR. *Fronde* spreading over the surface of rocks in crustaceous, lichenoid patches, from one to six or more inches in diameter; when young, orbicular, but becoming very irregular in outline when old, marked, more or less evidently, especially towards the margin, with concentric striæ or bands, about a line asunder. The surface of the frond in young specimens is nearly flat and even, but in full grown individuals it is much corrugated, and covered more or less with wart-like prominences; and very old plants present an exceedingly rugged surface, in which all traces of concentric striæ are lost. The structure of the frond is very dense and opaque, but thin, vertical slices exhibit an arrangement of the cellules into vertical closely packed filaments, strongly glued together. The *fructification* consists of scattered warts, composed of vertical, easily separable filaments, to whose bases are attached obovate, simple spores. Colour a dark, coffee-brown, becoming darker in drying. Substance between leathery and crustaceous, flexible.

This singular production more nearly resembles, to the naked

eye, a crustaceous Lichen, than an Alga, but its structure and fructification prove it to be widely different from any Lichen. There is a curiously close resemblance, both in the habit, the structure of the frond, and the outward character of its fruit, between *Ralfsia* and *Peysonellia*; yet, according to the received notions of arrangement, these plants must be referred to opposite parts of the system. They are, however, closely analogical forms, in the families to which they respectively belong. Except for the colour, and the different formation of the spores, there would be little to distinguish them.

Ralfsia deusta is a very common species throughout the Northern Atlantic Ocean, and probably extends along most of the shores of Europe, North Asia, and North America; though not yet recorded from the latter. Its crustaceous habit may often cause it to be over-looked.

Endlicher has confounded it with the very different *Hildenbrandtia rubra* (which is also common on the British coast); and Areschoug has, still more unhappily, put it into the same genus as *Cruoria pellita*, with which, in structure, it has very little connection. The resemblance between these is purely external.

The fructification of *Ralfsia* is either very rarely produced, or so difficult to find, owing to its obscurity, that it is rarely seen. It was first observed, I believe, by Dr. Johnston, who communicated the specimens to Mr. Berkeley, by whom they were described. Though myself familiar with this plant for many years, I had never seen the fruit, until I received fertile specimens from Dr. Dickie of Aberdeen, and from these I have made my analysis. On the west coast of Scotland and of Ireland this plant is excessively abundant, and its patches reach a large size. Devonshire specimens, communicated by the Rev. Mr. Cresswell, are much inferior.

Fig. 1. *RALFSIA DEUSTA*, young and old fronds:—*of the natural size*. 2. Vertical section of the frond. 3. Filaments of which the frond is composed. 4. Spores, among the filaments of a wart. 5. A spore and its filaments, separated:—*all more or less highly magnified*.

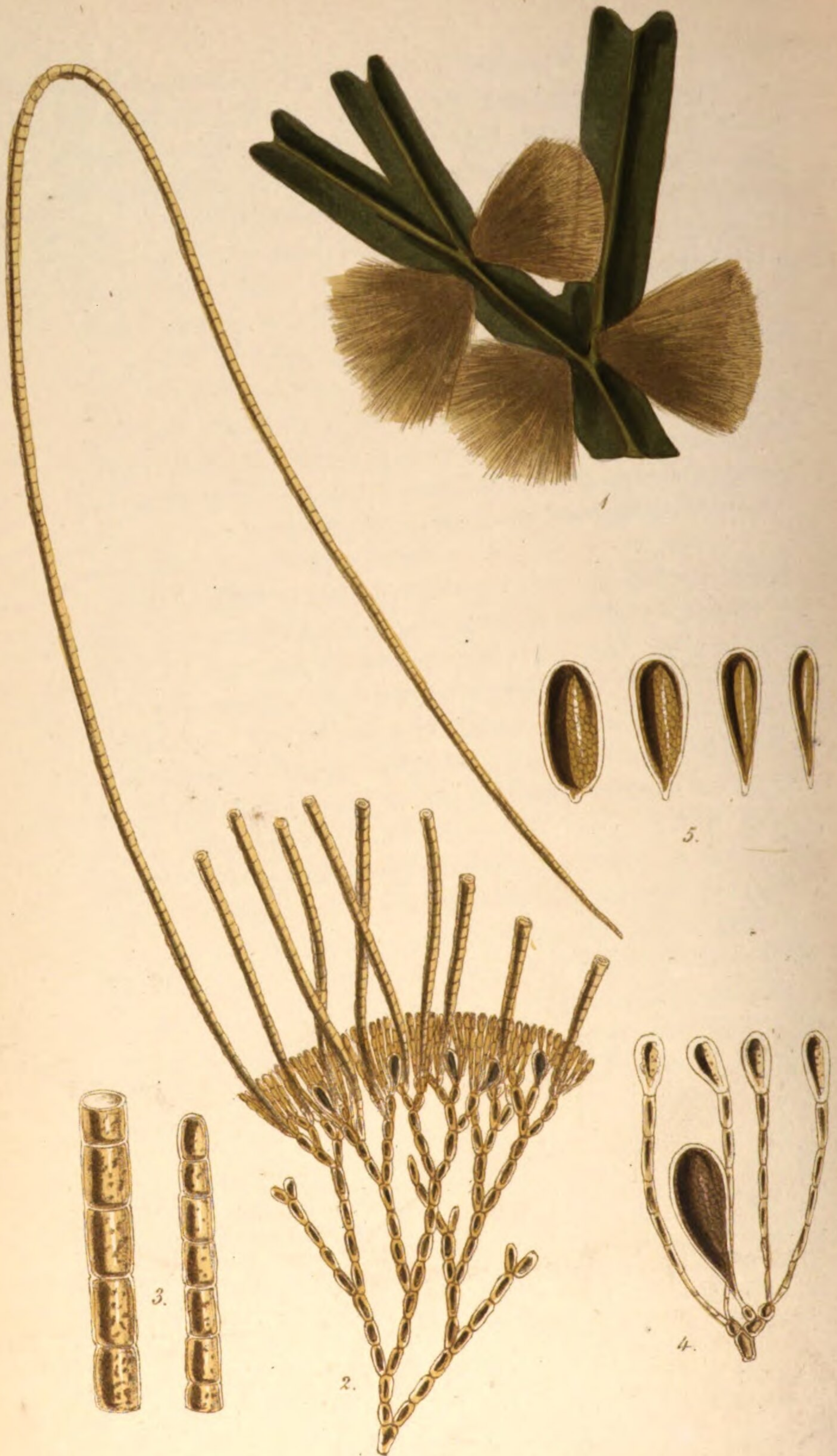


PLATE CCXL.

ELACHISTEA FUCICOLA, *Fries.*

GEN. CHAR. *Fron*d parasitical, consisting of a dense tuft of free, simple, articulated, olivaceous filaments, rising from a common tubercular base, composed of vertical branching fibres closely combined into a cartilaginous mass. *Fructification*, pear-shaped spores attached to the base of the filaments, concealed in the tubercle, and frequently accompanied by paranemata. ELACHISTEA (*Fries*), from ελαχιστα, the *least*; from the small size of these plants.

ELACHISTEA *fucicola*; tufts pencilled; filaments elongate, flaccid, membranaceous, attenuated upwards; articulations once or twice as long as broad; tubercular mass spherical.

ELACHISTEA *fucicola*, *Fries. Fl. Scan.* p. 317. *Aresch. Pug.* t. viii. f. 6-7. *J. Ag. Sp. Alg.* vol. i. p. 12.

MYRIONEMA *fucicolum*, *Endl.* 3rd. *Suppl.* p. 23.

PHYCOPHILA *fucorum*, and *P. Agardhii*, *Kütz. Phyc. Gen.* p. 330.

CONVERVA *fucicola*, *Velley, Pl. mar.* No. 4. *Dillw. Conf.* t. 66. *Lyngb. Hyd. Dan.* t. 50. *Ag. Syst.* p. 103. *Harv. in Hook. Br. Fl.* vol. ii. p. 354. *Harv. in Mack. Fl. Hib.* part. 3. p. 227. *Harv. Man.* p. 131. *Wyatt, Alg. Danm.* no. 192.

CONFERRA *ferruginea*, *Ag. Syst.* p. 103.

HAB. Parasitical on *Fucus serratus* and *F. vesiculosus*. Annual. Summer and Autumn. Common.

GEOGR. DISTR. Atlantic shores of Northern Europe. Baltic Sea.

DESCR. *Filaments* forming brush-like tufts, an inch in length, rising from a hemispherical, cartilaginous tubercle, which gradually increases in size as the plant advances in growth. This tubercle is composed of numerous dichotomous, articulated, vertical filaments, issuing from a common point, beneath the surface of the *Fucus* on which the parasite grows, and radiating in all directions. After several forkings the tips of the branches terminate in a cluster of linear club-shaped fibres or paranemata, three or four of which spring from each apex, and among these, which constitute the *periphery* of the tubercle, are attached both the *spores*, and the long *filaments* which form the brush-like tuft. *Filaments* an inch long, scarcely tapered at the base, much attenuated to the apex; the articulations once and a half to twice as long as broad. *Spores* at first club-shaped, then pyriform, and at length ellipsoidal. *Colour* olive-green, becoming brown or foxy.

This is the largest species, the longest known, and the com-

monest of the genus *Elachistea*. It infests *Fucus vesiculosus* and *F. serratus* almost wherever these plants grow, and may be found nearly at every season. At its first appearance it forms a minute pencil of greenish filaments rising from a scarcely perceptible tubercle. As it grows larger, the colour changes to brown, and the tubercle increases much in size, and at length becomes a button, attached by a central point. It then falls away and the plant perishes. The growth of other *Elachistea* is very similar.

By J. Agardh this genus is placed in *Ectocarpeæ*, but, in my opinion, incorrectly. The structure of the tubercle, in which the spores are lodged, is precisely that of the *Chordarieæ*, and did this tubercle constitute the whole plant, no doubt Professor Agardh would associate the genus with the latter family, for the whole structure of this part is analogous to that of *Leathesia*, and the nature and position of the *spores* the same. But then there are the long pencilled filaments composing the largest part of the frond; and these are very unlike anything found elsewhere in *Chordarieæ*, while they closely resemble the threads of an *Ectocarpus* in structure. Taking these filaments for *the frond*, Agardh would be correct in referring the genus to *Ectocarpeæ*. But, to my mind, the *tubercle*, as it contains the fructification, must be regarded as the most essential part of the structure; the *filaments* as an accessory part; and therefore I am of opinion that the genus is best placed in *Chordarieæ*.

Fig. 1. Tufts of *ELACHISTEA FUCICOLA*, growing on *Fucus vesiculosus*;—*the natural size*. 2. Part of a branching filament of the tubercle, with its paranemata, and excurrent filaments, one of which is bent back, the others cut off. 3. Portions of one of the excurrent filaments. 4. Paranemata and spore. 5. Spores in various stages of advancement;—*all magnified*.

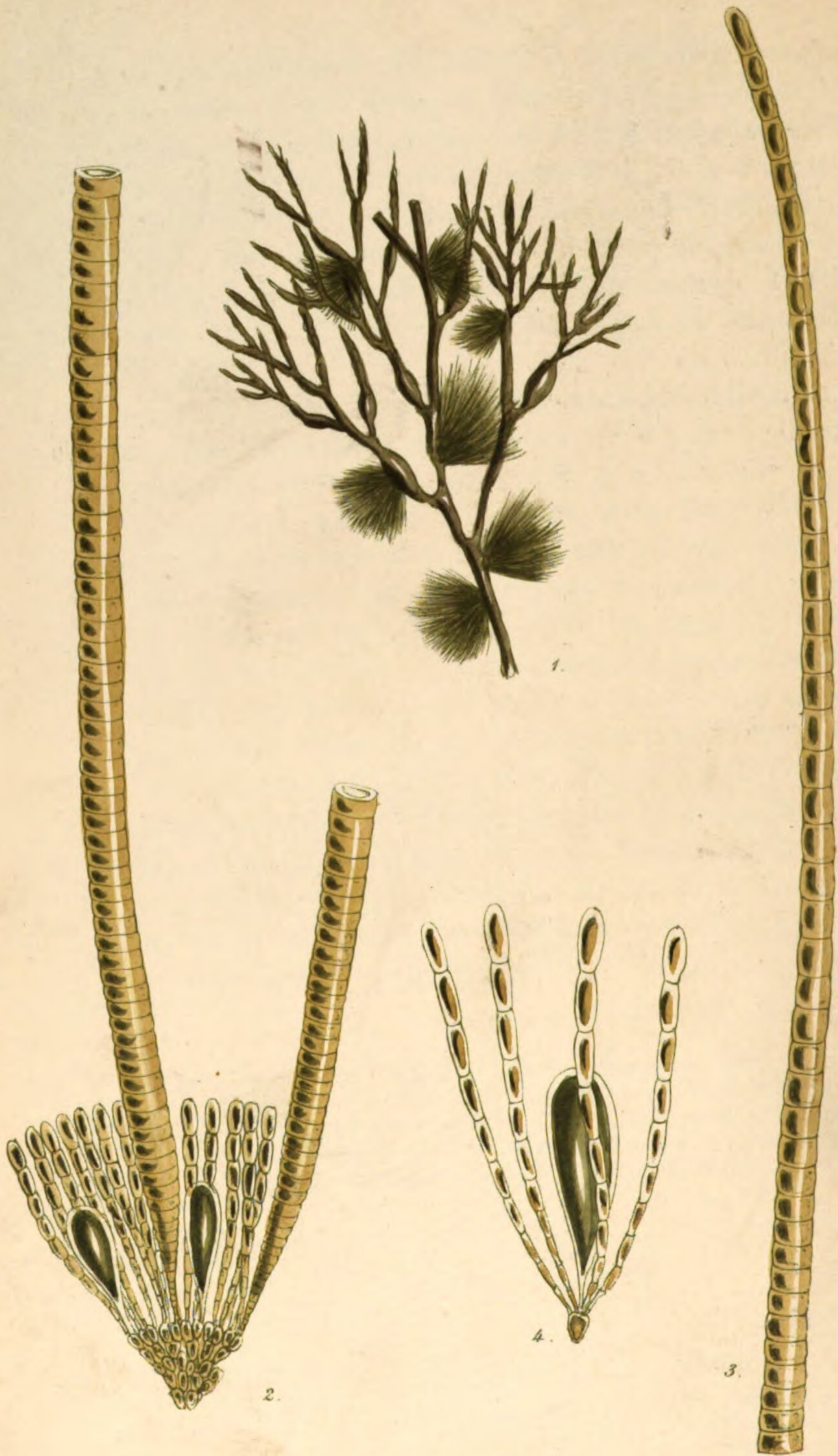


PLATE CCLX.

ELACHISTEA FLACCIDA, *Aresch.*

GEN. CHAR. *Fronde* parasitical, consisting of a dense tuft of free, simple, articulated, olivaceous filaments, rising from a common tubercular base, composed of vertical, branching fibres, closely combined into a cartilaginous mass. *Fructification*, pear-shaped spores attached to the bases of the filaments concealed in the tubercles, and frequently accompanied by paranemata. ELACHISTEA (*Fries*), — from ἐλαχιστα, the *least*; from the small size of these plants.

ELACHISTEA *flaccida*; tufts pencilled: filaments elongate, flaccid, membranaceous, much attenuated to the base; the lower articulations half as long as broad, the upper of equal length and breadth; tubercle hemispherical.

ELACHISTEA *flaccida*, *Aresch.*—*J. Ag. Gen. et Sp. Alg.* vol. i. p. 12. *Harv. Man.* ed. 2. p. 50. *Fr. Fl. Scan.* p. 317. *Eng. Bot.* t. 2912.

ELACHISTEA *breviarticulata*, *Aresch. in Linn.* vol. xvi. p. 234. t. 8. f. 5.

PHYCOPHILA *flaccida*, *Kütz. Phyc. Gen.* p. 330.

MYRIONEMA *breviarticulatum*, *Endl. 3rd Suppl.* p. 23.

CONFERVA *flaccida*, *Dillw. t. G. Harv. in Hook. Br. Fl.* vol. ii. p. 355. *Harv. in Mack. Fl. Hib.* part 3. p. 227. *Harv. Man.* ed. 1. p. 132. *Wyatt, Alg. Damn.* no. 292.

CONFERVA *obtusa*, *Ag. Syst.* p. 101.

CONFERVA *breviarticulata*, *Suhr, in Flora* 1831, p. 32. t. 4. f. 36, *x, y, z.*

HAB. Parasitical on *Cystoseira fibrosa*, common. Annual. Summer and autumn.

GEOGR. DISTR. Atlantic coasts of France and England.

DESCR. *Tubercle* small, one to three lines in diameter, hemispherical, very firm, composed of moniliform, dichotomous fibres densely compacted together, and not easily separable. From the tips of the fibres composing the tubercle spring the filaments, which are half an inch long, or something more, tapering extremely at the base, then rapidly widening to the middle, from which they taper very gradually to the upper extremity. *Articulations* in the lower and middle parts of the filament not quite half as long as broad, in the upper part as long as, or rather longer than, their breadth; the apex obtuse. Between the filaments spring numerous linear clavate paranemata, tapering to the base, and gradually swelling upwards; these have oval articulations, about thrice as long as broad. *Spores* lodged among the paranemata, obovate, on slender, short pedicels, dark olive. *Substance* flaccid and soft, readily adhering to paper in drying. *Colour* a pale greenish olive, sometimes yellowish or foxy.

A very common parasite on *Cystoseira fibrosa*, whose branches are rarely found free from the olive-coloured soft pencils of this little plant. In size and appearance to the naked eye there is much resemblance to *Elachistea fucicola* (Tab. CCXL.), except that the colour is generally greener, and the length of the tufts rather less; but under the microscope these species are very readily known from one another. *E. flaccida* is remarkable for the shortness of its articulations, in proportion to their breadth throughout the lower and middle portions of the filaments, and for the gradually increasing length of the cells towards the apices. The filaments, also, taper exceedingly at the base; and the tubercle from which they originate is of very much smaller size than in *E. fucicola*.

Fig. 1. Tufts of ELACHISTEA FLACCIDA growing on *Cystoseira fibrosa*. 2. Vertical section of part of a frond, showing a portion of the tubercle, with paranemata and spores, and part of two filaments. 3. Apex of a filament. 4. Spore, with its paranemata:—all magnified.

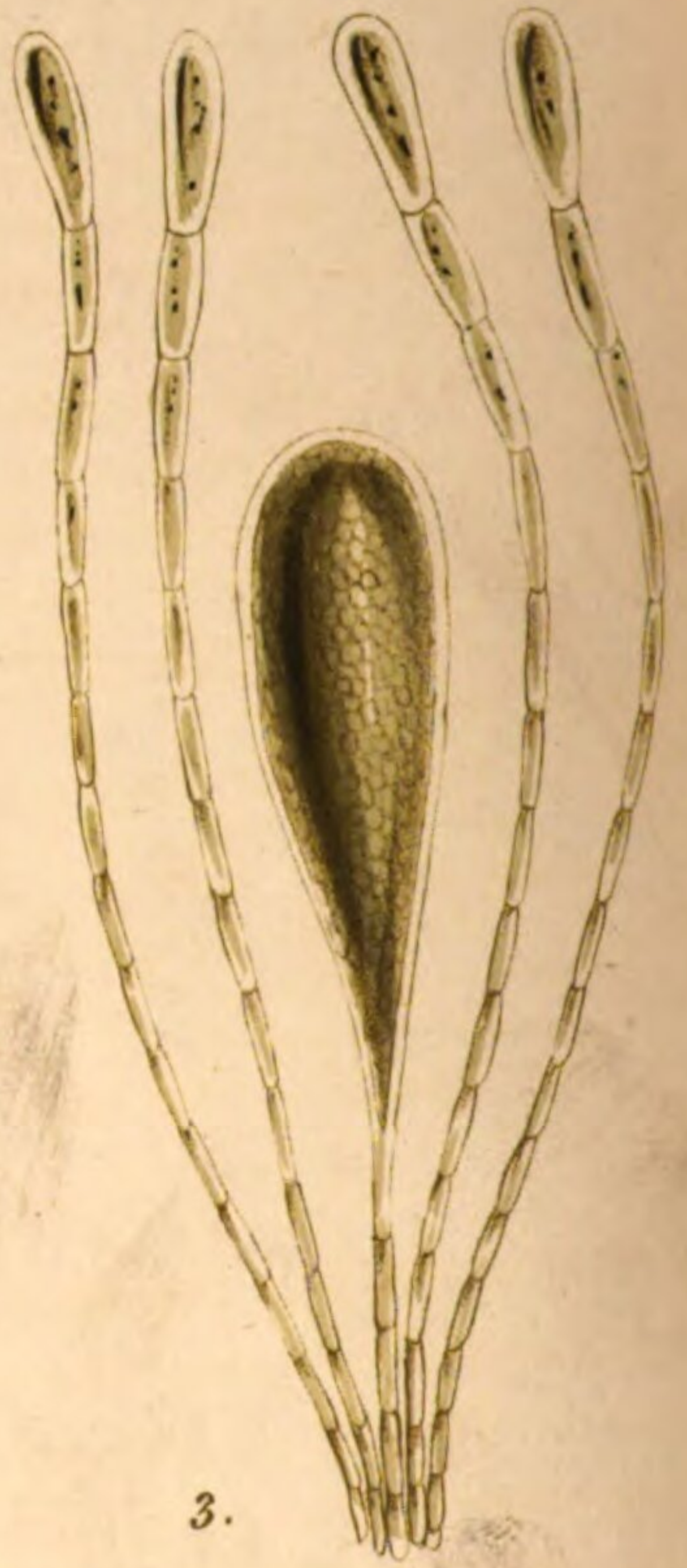
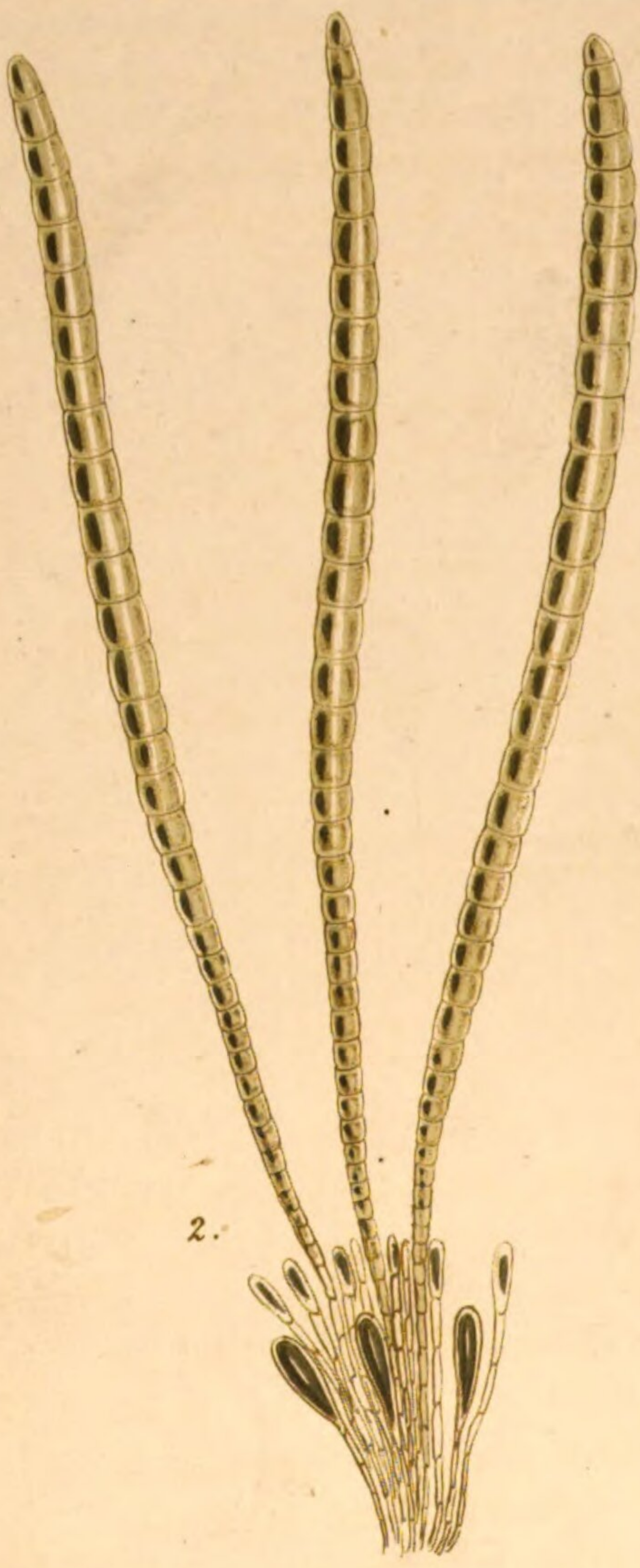


PLATE CCCXXXII.

ELACHISTEA CURTA, *Aresch.*

GEN. CHAR. *Frond* parasitical, consisting of a dense tuft of free, simple, articulated, olivaceous filaments, rising from a common tubercular base, composed of vertical, branching strings of cells, closely combined into a cartilaginous mass. *Fructification*, pear-shaped *spores* attached to the bases of the filaments concealed in the tubercles, and frequently accompanied by paranemata. ELACHISTEA (*Fries*),—from *ελαχιστα*, the *least*; from the small size of these plants.

ELACHISTEA *curta*; filaments very short, tapering to the base, obtuse, pencilled, rather rigid, rising from a tubercle; articulations about as long as broad; spores pyriform, on long pedicels; paranemata linear-clavate.

ELACHISTEA *curta*, *Aresch. in Linn.* vol. xvi. p. 234? *Harv. Man.* ed. 2. p. 50.

CONFERVA *curta*, *Dillw. t.* 76. *Ag. Syst.* p. 103. *Harv. in Hook. Brit. Fl.* vol. ii. p. 355. *Harv. Man.* ed. 1. p. 132.

HAB. On *Fuci*, between tide-marks. Annual. Summer. At Swansea, *Mr. L. W. Dillwyn.* (Not found recently.)

GEOGR. DISTR.

DESCR. *Tufts* minute, from one to three lines in diameter, with an evident tubercular base. *Filaments* linear-club-shaped, very slender below, and gradually widening upwards, ending in a blunt point. *Paranemata* filiform, composed of slender cylindrical cells, and tipped with a pyriform coloured cell. *Articulations* of the filaments about as long as broad, coloured. *Spores* large, pear-shaped, on longish stalks. *Colour* a brownish-olive, or foxy. *Substance* rather rigid. The plant does not adhere to paper.

This species has long been in doubt, and notwithstanding the figure and description now given, my doubts are not fully removed. By Dillwyn, who first described *E. curta*, it is said to be common in the neighbourhood of Swansea, and probably not rare elsewhere; yet no one has met with it of late years. I have repeatedly brought home the battered stumps of *E. fucicola* in the belief, always dissipated by the microscope, that I had met with *E. curta*; and my only acquaintance with the latter is from

an examination of a poor specimen preserved in Sir W. J. Hooker's Herbarium. The accompanying figure has been prepared from that specimen.

Fig. 1. ELACHISTEA CURTA:—*the natural size*. 2. Small part of the tuft:—*magnified*. 3. A spore, and four of the paranemata:—*highly magnified*.

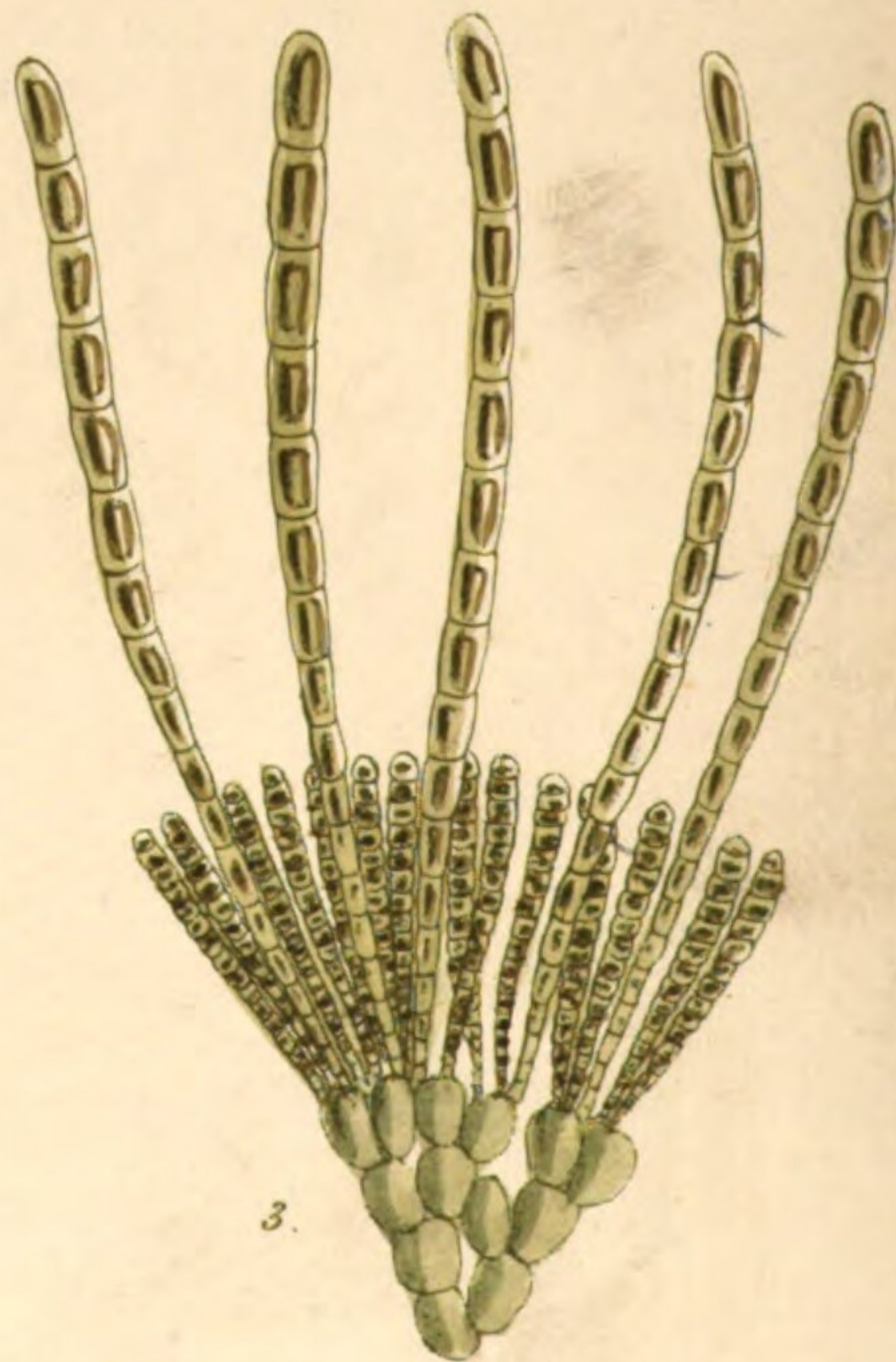
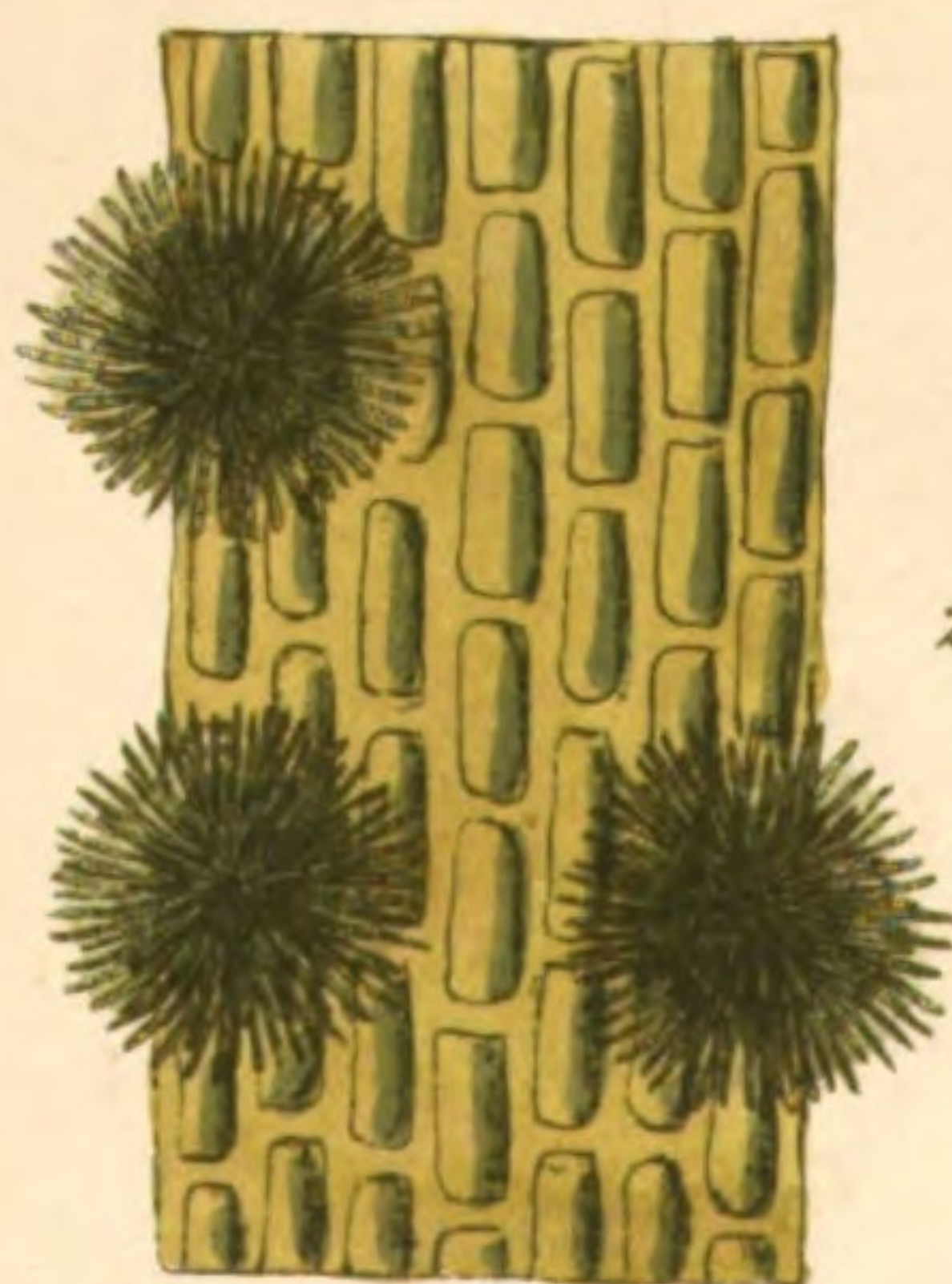


PLATE CCLXI.

ELACHISTEA STELLULATA, *Griff.*

GEN. CHAR. *Frond* parasitical, consisting of a dense tuft of free, simple, articulated, olivaceous filaments, rising from a common tubercular base, composed of vertical, branching fibres, closely combined into a cartilaginous mass. *Fructification*, pear-shaped spores attached to the bases of the filaments concealed in the tubercle, and frequently accompanied by paranemata. ELACHISTEA (*Fries*), — from ἐλάχιστα, the *least*; from the small size of these plants.

ELACHISTEA *stellulata*; tufts very minute, stellate; tubercle composed of large cells; filaments short, tapering to the base, linear club-shaped, obtuse; articulations about twice as long as broad, uniform; paranemata with short articulations.

ELACHISTEA *stellulata*, *Griff. MSS. Aresch. Pug. in Linn. vol. xvii. p. 261. tab. 9. f. 4. Harv. Man. ed. 2. p. 51.*

MYRIONEMA *stellulatum*, *J. Ag. et Gen. Sp. Alg. vol. i. p. 49.*

CONFERVA *stellulata*, *Harv. Man. ed. 1. p. 132.*

HAB. Parasitical on *Dictyota dichotoma*. Annual. Summer. Torquay, *Mrs. Griffiths.*

GEOGR. DISTR. Not observed out of England.

DESCR. *Tufts* exceedingly minute, scarcely half a line in diameter, appearing like dark brown specks, dotting over the surface of the *Dictyota*, and under the microscope resembling miniature *echini*. *Tubercle* well developed, composed of dichotomous strings of large, colourless cells. From the terminal cell of each string the filaments and paranemata arise. *Filaments* a quarter of a line in length, linear-clavate, gradually tapering from the obtuse apex to the base the articulations of nearly uniform size, all being from once and a half to twice as long as broad, constricted at the joints. Each articulation contains a bag of rather dark coloured endochrome. *Paranemata* very numerous, springing with the filaments, and about one-third as long, with very short articulations, club-shaped. *Spores* unknown to me. They are figured by Dr. Areschoug as obovate-oblong.

This minute and microscopically beautiful little plant was discovered some years ago by Mrs. Griffiths on the old fronds of *Dictyota dichotoma*, and first described in the first edition of the Manual of British Algæ. I have not seen any other specimens than those originally collected by Mrs. Griffiths, who met with the parasite infesting several specimens of the *Dictyota*; nor am I aware that any other observer has noticed it in Britain, or that

it has been detected elsewhere. The Alga on which it grows is so very widely scattered that our *Elachistea* ought, probably, to have a place in many distant floras, but its minute size has hitherto been its protection. It looks so much like the fructification of the *Dictyota*, when carelessly examined with the naked eye, or with a lens of small power, that it may often be passed over as such ; and I was once disposed to think that it might be merely a diseased proliferous state of that fructification. This opinion I have long abandoned, and recognised this production as a parasite, and true member of the genus *Elachistea*. In this latter point, however, I am at issue with my friend Professor J. Agardh, who places *E. stellulata* in the genus *Myrionema*. As far as size and outward characters go, such a position seems natural, but it will be found on closer inspection, that the filaments here are of two kinds, exactly as in *Elachistea*, and that they spring not from decumbent, adnate filaments, as in *Myrionema*, but from erect, radiating ones, compacted into a little tubercle.

Fig. 1. Part of a frond of *Dictyota dichotoma*, infested with the ELACHISTEA :—
of the natural size. 2. Some of the tufts on a portion of the membrane :—
magnified. 3. Vertical section of a part of tuft, most of the filaments
removed :—highly magnified.

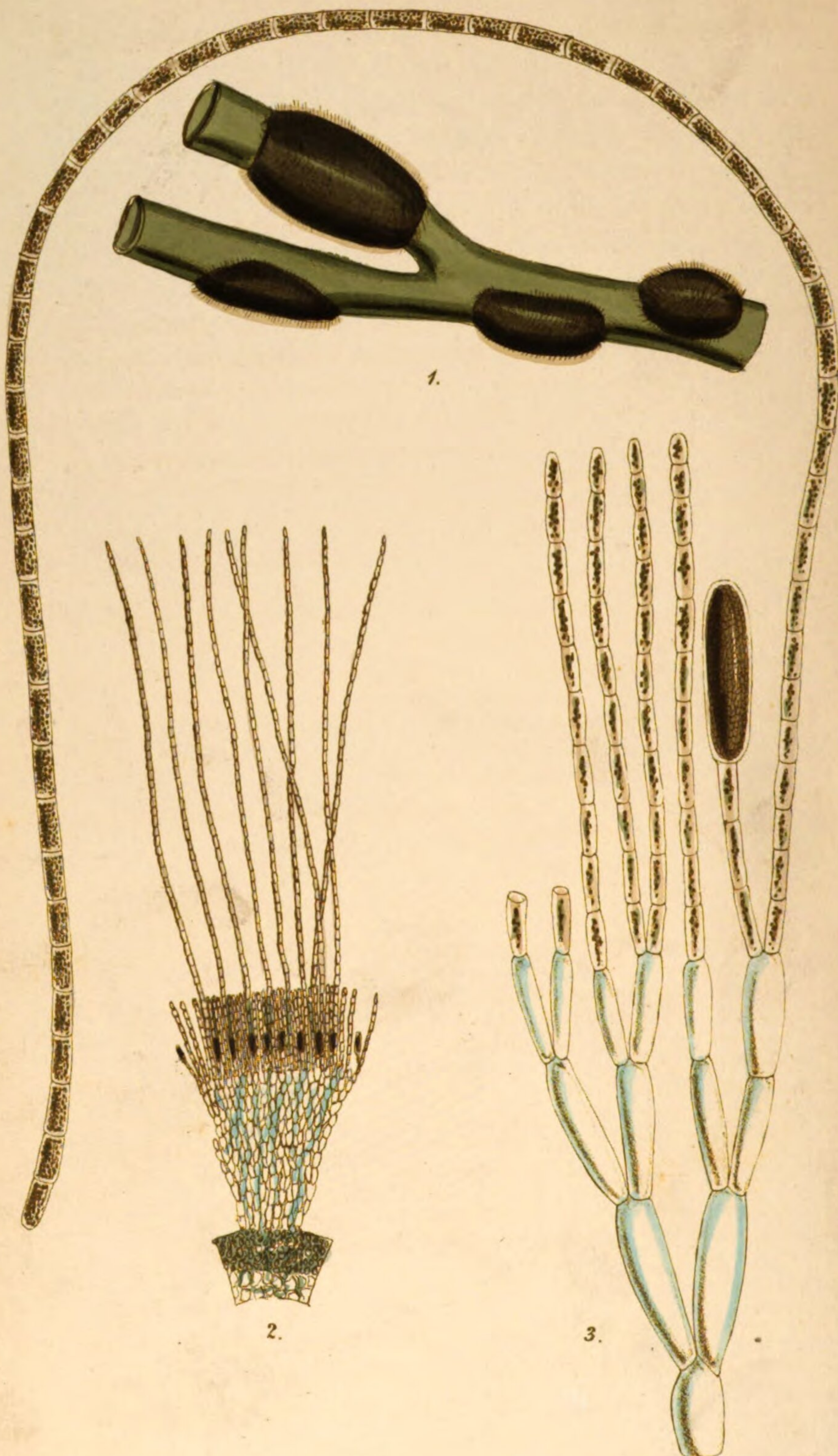


PLATE CCCXXIII.

ELACHISTEA SCUTULATA, *Duby*.

GEN. CHAR. *Fronde* parasitical, consisting of a dense tuft of free, simple, articulated, olivaceous filaments, rising from a common tubercular base, composed of vertical branching fibres, closely combined into a cartilaginous mass. *Fructification*, pear-shaped spores attached near the bases of the filaments, concealed in the tubercle, and frequently accompanied by paranemata. ELACHISTEA (*Fries*),—from ελαχιστα, the *least*; from the small size of these plants.

ELACHISTEA *scutulata*; filaments short, rising from an oblong, convex, shield-like tubercle, composed of densely packed, branching fibres; articulations twice or thrice as long as broad; spores oblong.

ELACHISTEA *scutulata*, *Duby*, *Bot. Gall.* vol. ii. p. 972. *Harv. Man.* ed. 2. p. 50. *Kütz. Syst. Alg.* p. 540. *J. Ag. Sp. Alg.* p. 11.

CONFERVA *scutulata*, *Eng. Bot.* t. 2311. *Harv. in Hook. Br. Fl.* vol. ii. p. 355. *Harv. in Mack. Fl. Hib.* part 3. p. 227. *Harv. Man.* ed. 1. p. 132. ed. 2. p. 50. *Wyatt, Alg. Danm.* no. 223.

HAB. Parasitical on the thongs of *Himanthalia lorea*. Annual. Summer and autumn. Very common.

GEOGR. DISTR. Shores of Europe.

DESCR. *Tubercles* forming oblong swellings on the thongs of *Himanthalia*, from half an inch to one, two, or more inches in length, and from a quarter to nearly half an inch in thickness; sometimes extending along the edges of the thong, sometimes occupying its surface, or wholly clasping it round. The *tubercle* is of a very solid, cartilaginous consistence, composed of extremely closely packed, dichotomous, hyaline filaments, whose cells are somewhat pyriform: it continues to grow in thickness as the plant advances to maturity. The apices of these branching filaments, at the outer edge of the tubercle, bear closely-packed *paranemata*, and long, free, penicillate filaments; with *spores* concealed among the *paranemata*. Penicillate-filaments cylindrical, their cells nearly empty below, toward the apex filled with an olive-coloured granular fluid. *Articulations* about thrice as long as broad. *Spores* oblong, very obtuse at both ends, borne on long pedicels. *Substance* cartilaginous, with a slimy surface. In drying the plant shrinks considerably, and under pressure adheres to paper.

This curious parasite, quite an interesting object under the microscope, is found wherever *Himanthalia lorea* (*Sea-thongs*) abounds. It frequently completely covers the long, strap-shaped

receptacle of that plant for the space of several inches, forming swellings of a dark colour and very slippery surface.

By Prof. Kützing this species alone is retained in the genus *Elachistea*, the other species of authors being placed by him either in *Phycophila* or in *Myriactis*. There are some minor differences of structure observable among these plants, chiefly as respects the composition and degree of development of the tubercular base, but there is so close a resemblance in habit, and such an identity of nature running through the whole, that I am unwilling to cumber the science with additional generic names.

Fig. 1. Shields of *ELACHISTEA SCUTULATA* on part of a thong of *Himanthalia lorea*:—*the natural size*. 2. Vertical slice of a portion of the tubercle, and of the surface of the nurse-plant. 3. Small portion of the same, showing the *short* filaments (or paranemata); a spore; and one of the long filaments, &c.:—*highly magnified*.

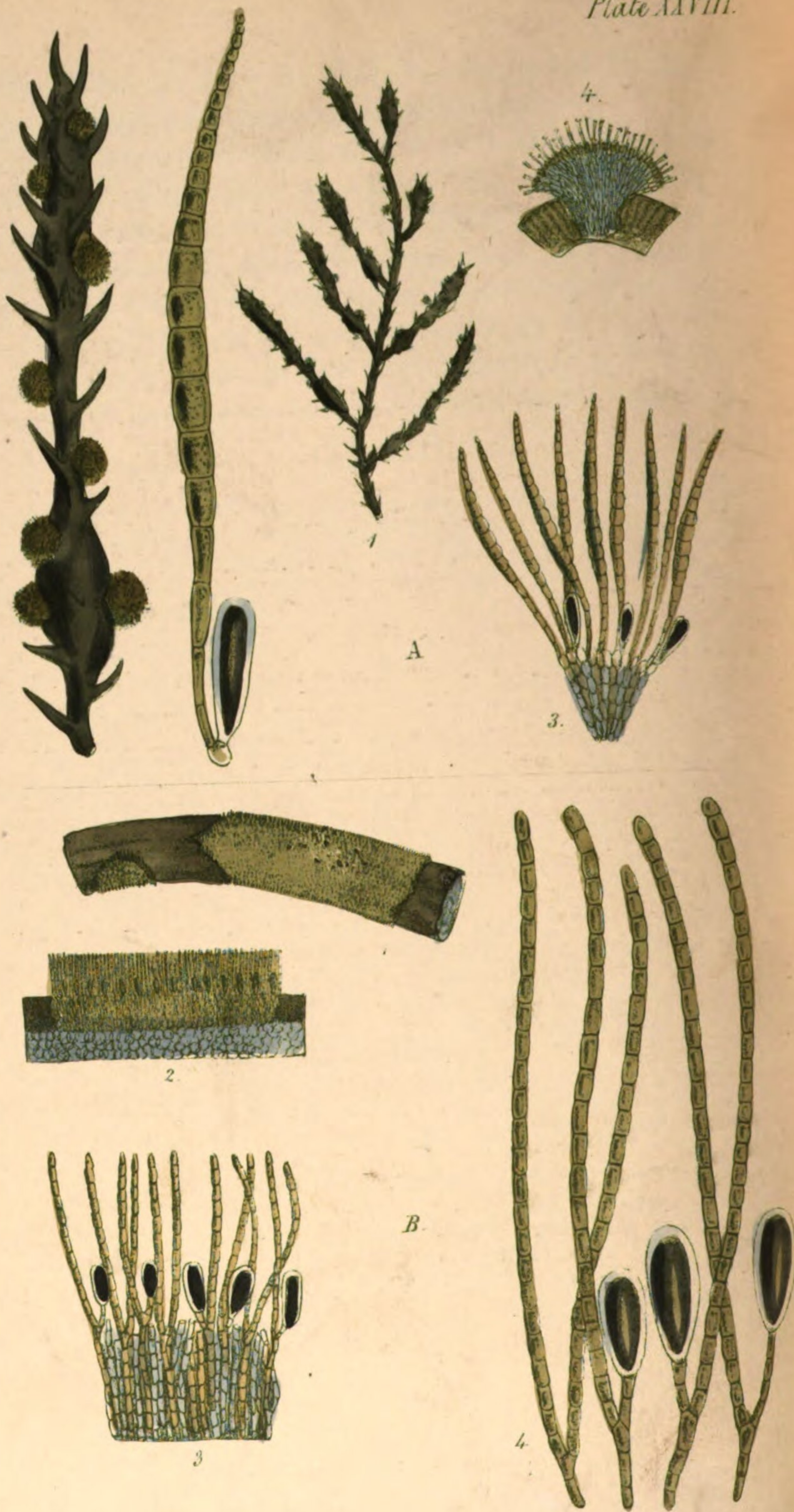


PLATE XXVIII. (A).

ELACHISTEA ATTENUATA, Harv. (sp. nov.)

GEN. CHAR. *Parasites* composed of simple, vertical, or radiating, jointed filaments, issuing from beneath the surface-cellules of other Algæ; the lower part of the filaments hyaline and compacted together into a tubercle, the upper-half coloured (olive), free. *Spores* oblong, mostly stalked, affixed to the bases of the free portion of the filaments, or to the tubercular base. ELACHISTEA (*Duby*)—seemingly from ἐλάχιστα, the least.

ELACHISTEA *attenuata*; tufts very minute, globose; filaments fusiform, much attenuated toward both ends, the basal joints 3–4 times, the middle once and a half, the apical about as long as broad; spores linear-obovate, subsessile at the base of the filaments.

HAB. Parasitical on the fruiting branches of *Cystoseira ericoides*. Annual. Summer and Autumn. At Elberry Cove, Torbay, Sep. 1844, Mrs. Griffiths and W. H. H.

GEOGR. DISTR. South of England.

DESCR. *Tufts* half a line to nearly a line in diameter, spherical, originating in a minute tubercle, which extends its roots (or bases of its filaments) into the substance of the *Cystoseira*. *Filaments* from a quarter to nearly half a line in length, thickened in the middle, tapering greatly to either end, obtuse, jointed. Lower *articulations* nearly colourless, slender, cylindrical, 3–4 times longer than broader; middle *articulations* sub-elliptical, contracted at the dissepiments, once and half as long as broad, containing a bag of bright olive granular endochrome; upper *articulations* gradually shorter upwards, and gradually moniliform towards the apex. *Spores* abundantly produced at the base of the filaments, narrow obovate, dark olive, with a wide limbus.

In a delightful excursion, made in the autumn of 1844, in company with my valued friend Mrs. Griffiths, to visit the habitat of *Gigartina Teedii* at Elberry Cove, we observed that most of the fronds of *Cystoseira ericoides*, which grows in great luxuriance on an exposed rock in the cove, were infested with the minute parasite here represented. The size and shape of the filaments readily distinguish it from any of the British *Elachistæ*; but in these characters it agrees with *E. rivulariæ*, Suhr., from which it is chiefly distinguished by the globose form of the tuft. *E. rivulariæ*, which also inhabits *Cystoseiræ*, and will probably

be detected in this country, is described as being effused, in the manner of *E. velutina*.

A. Fig. 1. Branchlet of *Cystoseira ericoides* infested with *Elachistea attenuata*:—*natural size*. 2, Fragment of the same, slightly magnified. 3. Portion of the *Elachistea*. 4. Tubercular base of the same, in its position. 5. A filament and spore:—*all magnified*.

PLATE XXVIII. (B).

ELACHISTEA VELUTINA, *Fries*.

ELACHISTEA *velutina*; spreading in thin, indefinite, velvety patches; filaments very minute, equal in diameter throughout, dissepiments slightly contracted; joints once, to one and a half times as long as broad; spores elliptical, pedicellate, affixed to the lower part of the filaments.

ELACHISTEA *velutina*, *Fries, Flor. Scan.* 317. *Aresch. in Linnæa*, vol. xvi. p. 235. t. 8. f. 9.

MYRIONEMA *velutinum*, *Endl. 3rd Suppl.* p. 23.

SPHACELARIA? *velutina*, *Grev. Crypt. Fl.* t. 350. *Harv. in Hook. Br. Fl.* vol. ii. p. 325. *Harv. in Mack. Fl. Hib.* part 3. p. 181. *Harv. Man.* p. 39.

HAB. Parasitical on *Himanthalia lorea*, frequent. On *Fucus serratus*, *Dr. Greville*. Shores of the British Islands.

GEOGR. DISTR. Atlantic coasts of Europe; probably common.

DESCR. Forming dark olive, velvety patches of indefinite extent on the surface of the fuci affected, rooting in their substance. *Filaments* about a line in height, linear, obtuse, coloured, except at the very base, simple, or occasionally forked at a joint or two above the base. *Articulations* once, or twice as long as broad, slightly contracted at the dissepiments. *Spores* elliptical or oblong, or somewhat obovate, dark olive, with a wide limbus, supported on slender pedicels, which are evidently contracted filaments.

Elachistea velutina was first observed by Dr. Greville who published an excellent figure of it in the sixth volume of his 'Cryptogamic Flora'. It occurs commonly on the long strap-shaped receptacles of *Himanthalia lorea*; but I have not seen it on *Fucus serratus*. Mr. Ralfs, who finds it abundantly on the *Himanthalia*, remarks that it very frequently accompanies *E. scutulata*, and often so closely resembles that species that it becomes difficult to distinguish them, except by the form of the spores. Usually, however, *E. scutulata* is readily known by occurring in raised, oval, shield-like patches.

B. Fig. 1, Fragment of *Himanthalia lorea* infested with *Elachistea velutina*:—*natural size*. 2. Lateral sectional view of a portion of the *Elachistea*, in situ. 3. Portion of the same. 4. Filaments in fruit, detached:—*more or less magnified*.

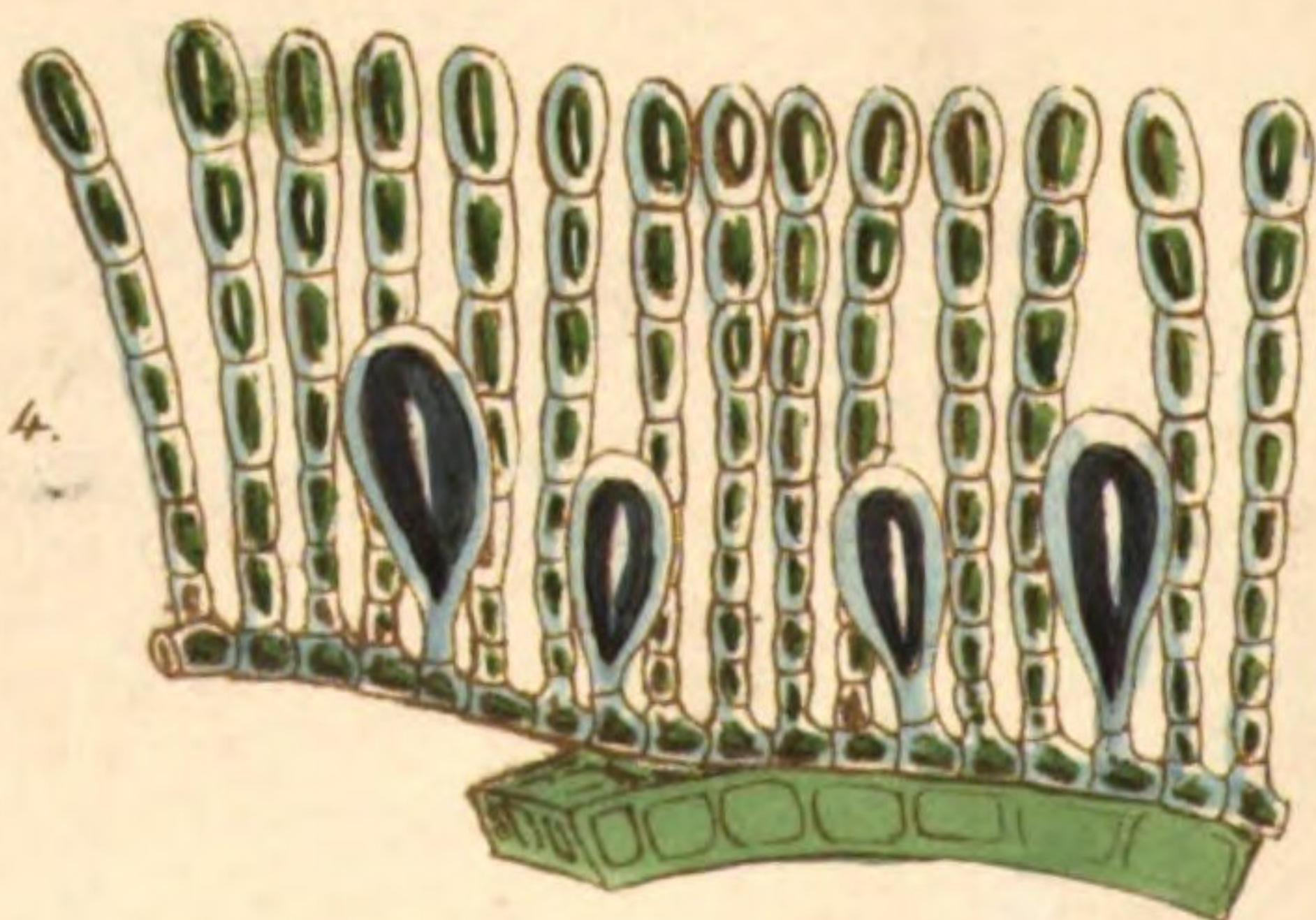
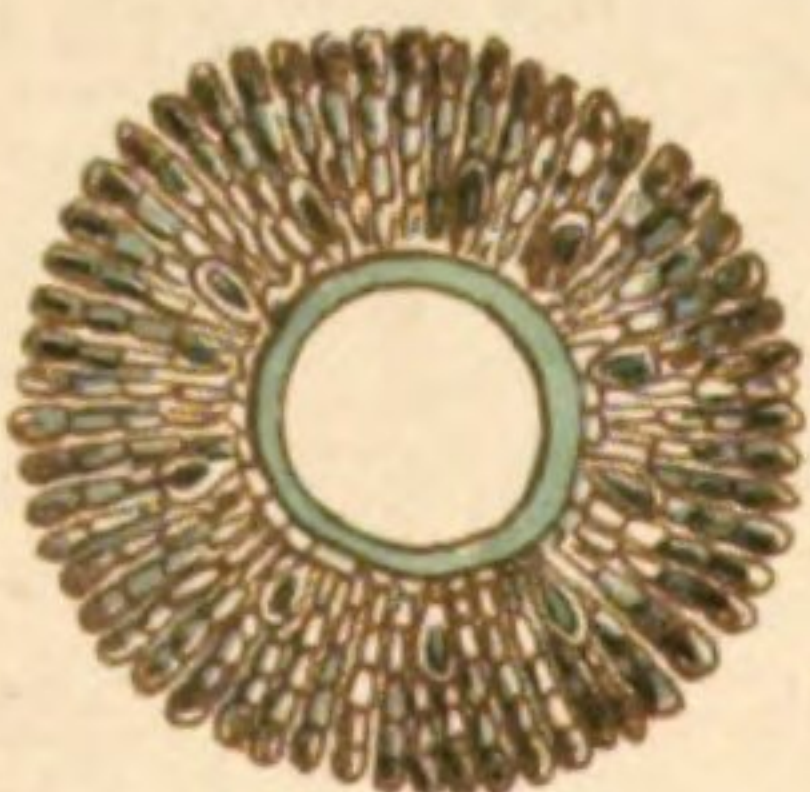
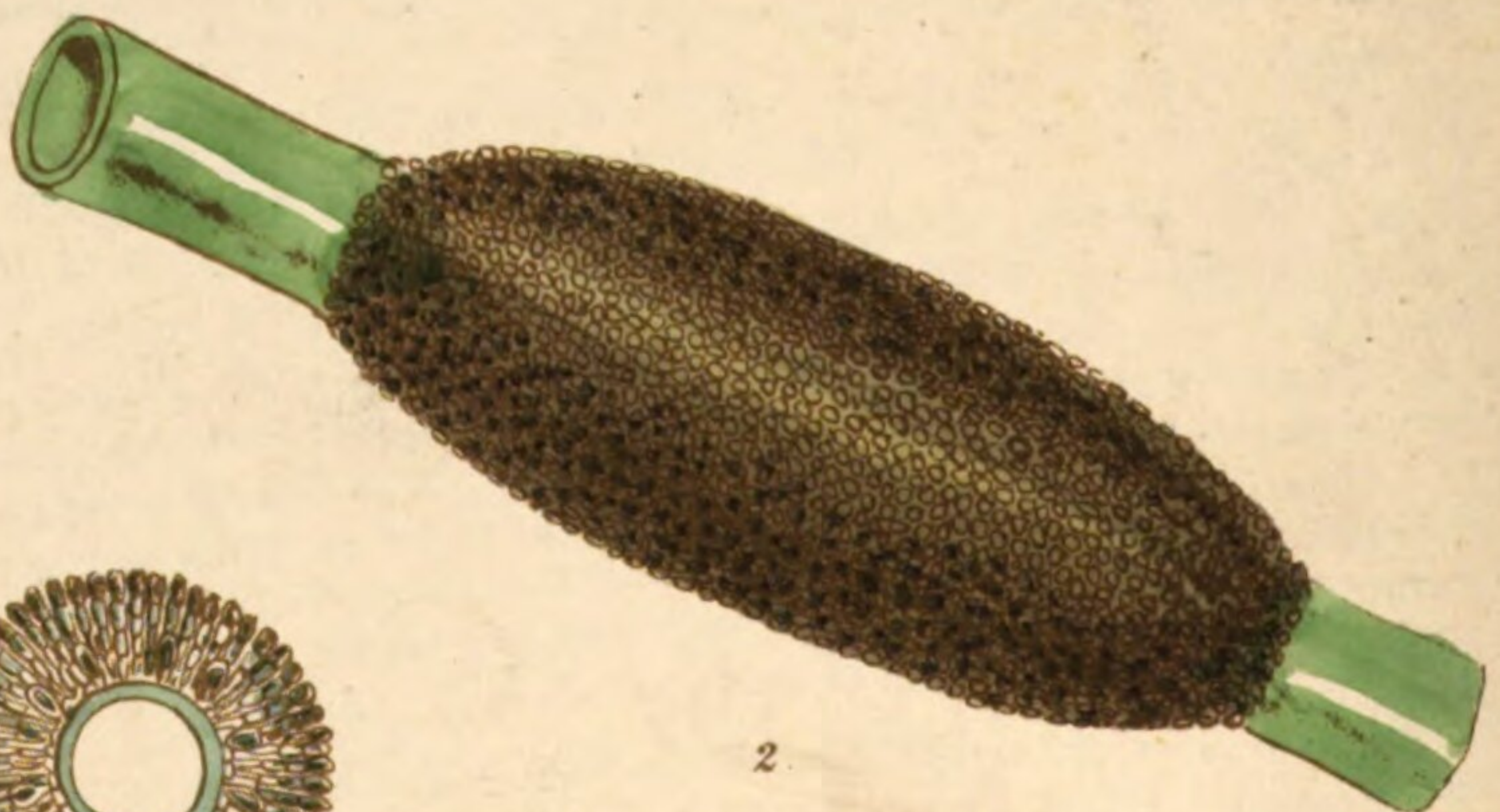


PLATE CCLXXX.

MYRIONEMA STRANGULANS, Grev.

GEN. CHAR. Minute *parasites*, consisting of a mass of short, erect, simple, jointed filaments, which spring from a thin expansion formed of decumbent, cohering filaments, spreading in patches on the surface of other Algæ. *Spores* oblong, affixed either to the erect, or to the decumbent filaments. MYRIONEMA (Grev.),—from *μυριος*, *numberless*, and *νημα*, a *thread*.

MYRIONEMA *strangulans*; patches convex, confluent, brown; the vertical filaments clavate, densely set; spores obovate, on short stalks, attached to the decumbent filaments.

MYRIONEMA *strangulans*, Grev. *Crypt. Fl.* t. 300. *Harv. in Hook. Br. Fl.* vol. ii. p. 391. *Harv. in Mack. Fl. Hib.* part 3. p. 223. *Harv. Man.* ed. 2. p. 51. *J. Ag. in Gen. and Sp. Alg.* vol. i. p. 48. *Kütz. Sp. Alg.* p. 540.

HAB. Parasitical on the fronds of various *Ulvæ* and *Enteromorphæ*. Annual. Summer and autumn. Common.

GEOGR. DISTR. Probably widely dispersed.

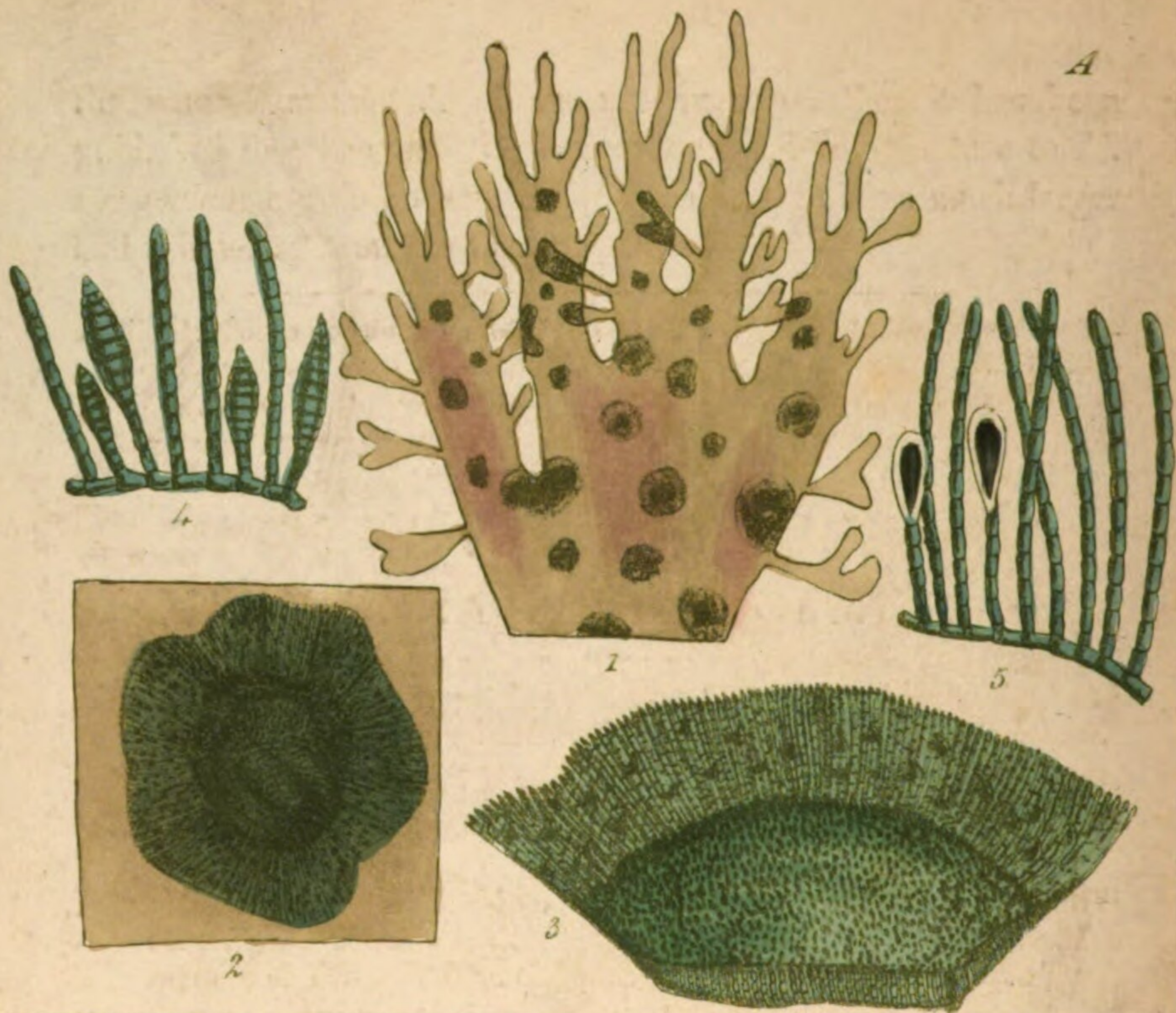
DESCR. The parasite first appears in the form of a dark brown stain, spotting the *Ulvæ* on which it grows, and at this stage consists of little more than an imperfect membrane composed of prostrate filaments. As it advances in growth the erect filaments are developed: the spots become convex, and gelatinous, and the plant is matured. It then, when growing on the cylindrical fronds of an *Enteromorpha*, completely invests the stem, forming a collar round it. Under the microscope, looking vertically on the parasite, the whole appears like a soft cushion, composed of innumerable brown dots set in a gelatinous matrix. These dots are the tips of the erect filaments, and the proper structure may be seen either by making a thin transverse slice, or by bruising the frond between two flat pieces of glass. The little plant will then be resolved into its component parts. *Spores* of large size, obovate, pedicellate, rising from the prostrate filaments, generally abundant. Articulations of the erect filaments about once and a half as long as broad, contracted at the joints, containing an olive endochrome.

In our first volume are figured (Plate XLI.) two species of *Myrionema*, a genus founded by Dr. Greville for the reception of the curious and beautiful little parasite here represented. *M. strangulans* abounds on all our coasts, and will always afford the possessor of a microscope an interesting subject for examination. The dark brown specks on the fronds of *Enteromorphæ*

and *Ulvæ*, which look like incipient decay, are very often caused by the growth of our parasite, and their colour will direct the most unexamining eye to them. I have generally found the plant in a perfect state in summer and autumn, but specimens may be found at most seasons.

Fig. 1. Part of a frond of *Enteromorpha*, infested with MYRIONEMA STRANGULANS :—*the natural size*. 2. A frond of the *Myrionema*, seen vertically. 3. Transverse section of the same. 4. Filaments and spores :—*all more or less highly magnified*.

A



B



PLATE XLI. (A).

MYRIONEMA LECLANCHERII, Harv.

GEN. CHAR. Minute *Parasites*, consisting of a mass of short, erect, simple, jointed filaments, which spring from a thin expansion formed of decumbent, cohering filaments, spreading in patches on the surface of other Algæ. *Spores* oblong, affixed either to the erect, or to the decumbent filaments. MYRIONEMA (*Grev.*)—from *μύριος*, a thousand, and *νήμα*, a thread.

MYRIONEMA *Leclancherii*; patches orbicular, thin, and with few vertical filaments toward the edges, convex with crowded filaments in the centre; spores on long pedicels affixed to the decumbent filaments, obovate.

RIVULARIA *Leclancherii*, *Chauv.*—see. *Lenorm. in litt.*

HAB. On decaying fronds of *Rhodymenia palmata*, probably common. Annual. Autumn. Torquay, *Mrs. Griffiths*. Down coast, *Mr. W. Thompson*, 1835.

GEOGR. DISTR. Shores of Europe.

DESCR. *Patches* from a line to a quarter of an inch or rather more in diameter, orbicular, or slightly irregular in form, composed at first of decumbent filaments radiating from a centre, and spreading on the surface of the *Rhodymenia*, closely cohering together into a thin membranous expansion, which is finely serrated at the edges. As the plant advances to perfection, vertical filaments, closely set together, spring in the centre of the patch, where they form an *umbo*, and gradually are developed outwards, becoming shorter and shorter as they approach the edge. Beyond this *umbo* a wide margin, destitute of vertical filaments or with a few scattered short ones, extends. *Spores* obovate, on long pedicels, or on the apices of abbreviated filaments. At other times—and, indeed, more frequently—some of the vertical filaments are found altered into lanceolate pod-like bodies, represented at fig. 4, jointed, but seemingly destitute of sporaceous matter. Colour olive brown.

In Autumn the fronds of the common *Dulse* (*Rhodymenia palmata*) in passing to decay are commonly found covered with roundish olive spots, which, by a hasty observer may be overlooked as being nothing more than incipient mortification. By placing a small portion of such a spotted frond under the microscope, the beautiful parasite here figured is brought to light. It was first pointed out to me by *Mrs. Griffiths* in 1845, who found it very plentifully at Meadfoot, near Torquay, and who received specimens identical in every respect from *M. Lenormand* under

the name here quoted. I am not aware whether it has been published by Chauvin. It is nearly related in structure to *M. strangulans* but differs something in habit, forming a much larger and thinner spot on the fucus.

A. Fig. 1. Portion of the frond of *Rhodymenia palmata* with *Myrionema Leclancherii* growing upon it:—*natural size*. 2. *Myrionema Leclancherii*. 3. Portion of the same. 4. Filaments from the same. 5. Filaments and spores *in situ*:—*all more or less magnified*.

PLATE XLI. (B).

MYRIONEMA PUNCTIFORME, Harv.

MYRIONEMA *punctiforme*; patches globose; filaments tapering to the base; spores linear-obovate, affixed to the vertical filaments near their base.

MYRIONEMA *punctiforme*, Harv. in Hook. Br. Fl. vol. ii. p. 391. Man. p. 124.

LINKIA *punctiformis*, Lyngb. Hyd. Dan. t. 66. Carm. Alg. App. ined. cum icone.

HAB. Parasitical on the Florideæ. Annual. Summer and Autumn On *Chrysomenia clavellosa*, at Appin, Capt. Carmichael. On *Ceramium rubrum*, at Torquay, Mrs. Griffiths.

GEOGR. DISTR. Shores of Europe.

DESCR. Fronds or patches very minute, half a line or less in diameter, flattish or globose, composed of vertical threads radiating from a small base. Filaments slightly tapering to the base, with joints twice or thrice as long as broad. Spores sessile near the bases of the erect filaments, very narrow in proportion to their length, and much attenuated at the base.

This little parasite is obviously nearly akin to *M. Leclancherii*, from which its globose fronds or patches, and more narrow spores distinguish it. It comes nearer to *M. strangulans*, but differs in the position of the spores. The only specimens which I have seen were collected by Mrs. Griffiths several years ago. They were found on *Ceramium rubrum*, which they covered nearly as closely as the warts of fructification cover *Stilophora rhizodes*. Probably, if looked after, it may be found on many of our coasts. It was added to the British Flora by the late Capt. Carmichael, of Appin, whose many discoveries in minute botany have rendered his name familiar to most algologists.

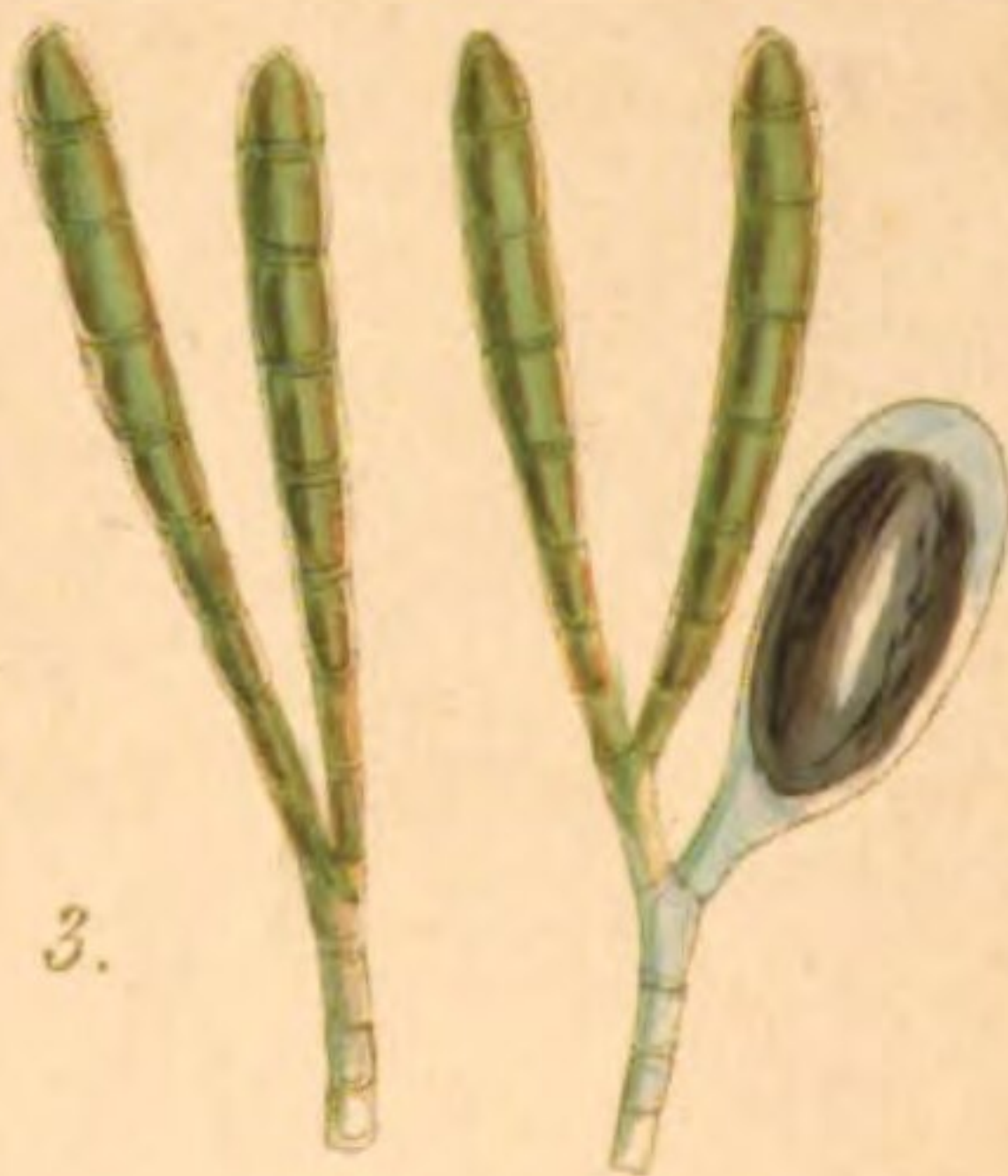
B. Fig. 1. *Ceramium rubrum* with *Myrionema punctiforme* parasitical upon it:—*natural size*. 2. Branch of the same. 3. Vertical section of part of the *Myrionema*. 4. Filaments with spores. 5. A Spore:—*all more or less highly magnified*.



1.



2.



3.

PLATE CCCXLVIII.

MYRIONEMA CLAVATUM, *Carm.* (sp.)

GEN. CHAR. *Minute* parasites, consisting of a mass of short, erect, simple, jointed filaments, which spring from a thin expansion formed of decumbent, cohering filaments, spreading in patches on the surface of other Algæ. *Spores* oblong, affixed either to the erect or to the decumbent filaments. MYRIONEMA (*Grev.*),—from *μυριος*, *numberless*, and *νημα*, a *thread*.

MYRIONEMA *clavatum*; “very minute, rather convex; filaments clavate, mostly bifid; spores obovate, pedicellate, affixed to the filaments.”

MYRIONEMA *clavatum*, *Harv. in Hook. Br. Fl.* vol. ii. p. 391. *Harv. Man.* ed. 2. p. 51. *Kütz. Sp. Alg.* p. 540.

LINCKIA *clavata*, *Carm. Alg. App. ined. cum Ic.*

HAB. On a thin purple cartilaginous crust, probably a *Verrucaria*, which covers the pebbles at the half-tide level. Autumn. Appin, *Capt. Carmichael*, who adds, “The parasite is so much of the colour of the crust, it requires a microscope to detect it.”

Of this curious little parasite I know nothing more than is learned from the above short description, which, with the two upper figures of our plate, is copied from *Capt. Carmichael's* manuscripts. The lower figure is added as an enlarged representation of a portion of the middle figure. I am indebted to the *Rev. M. J. Berkeley* for a sketch, copied from the original by *Carmichael*.

Fig. 1. MYRIONEMA CLAVATUM, growing on a dark-coloured crust, upon a quartz pebble:—*the natural size*. 2. The *Myrionema* filaments:—*magnified*. 3. A barren and fertile filament:—*more highly magnified*.

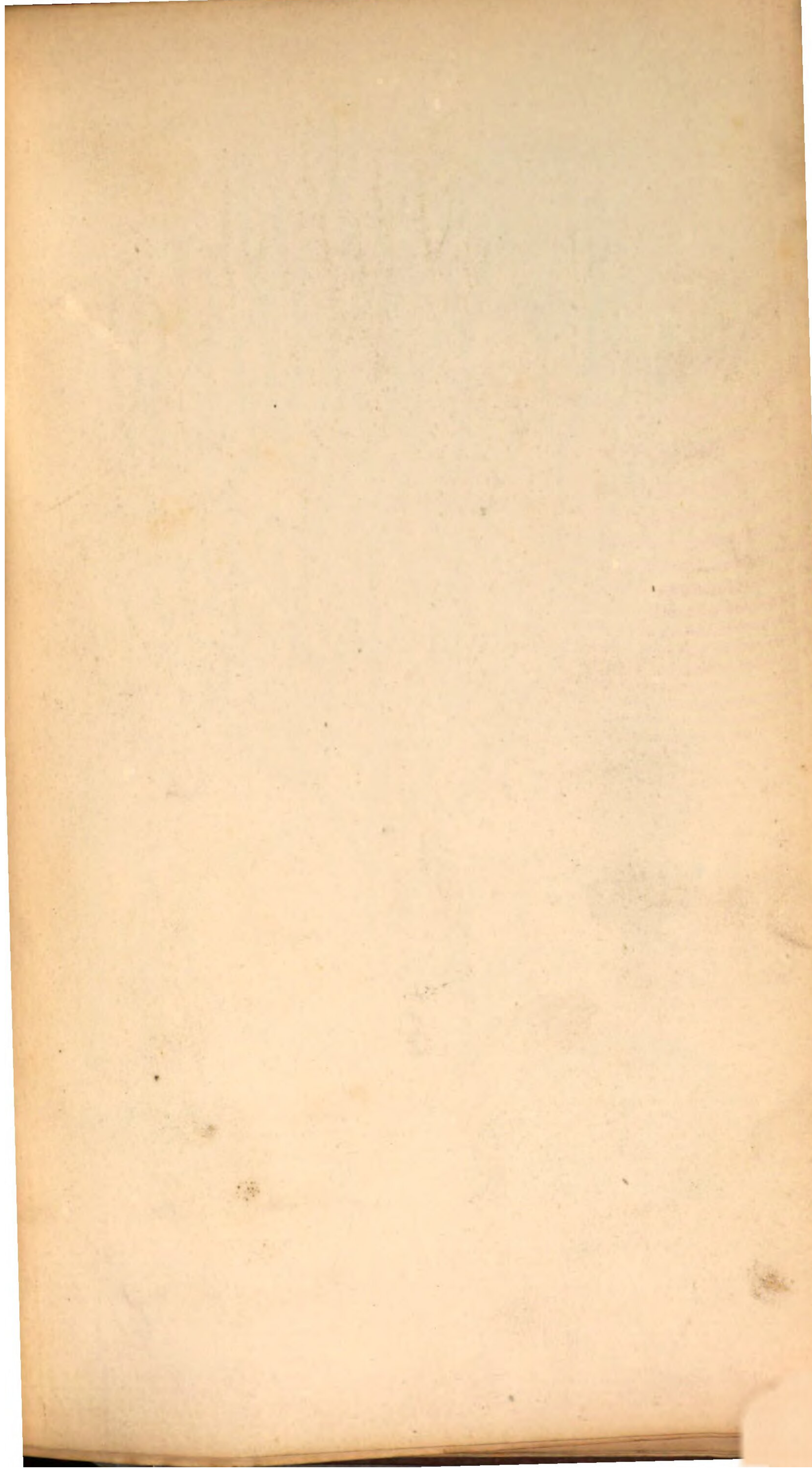




PLATE XXXIII.

CLADOSTEPHUS VERTICILLATUS, *Ag.*

GEN. CHAR. *Fronde* inarticulate, rigid, cellular, whorled with short, jointed, subsimple ramuli. *Fructification*; elliptical utricles, furnished with a limbus, pedicellate, borne on accessory ramuli. CLADOSTEPHUS (*Ag.*)
—from κλάδος, a branch; and στέφος, a crown.

CLADOSTEPHUS *verticillatus*; branches slender; ramuli mostly forked, regularly whorled, the whorls at short intervals.

CLADOSTEPHUS *verticillatus*, *Ag. Syn. Introd.* p. xxv. *Iyngb. Hyd. Dan.* p. 102. t. 30. *Hook. Fl. Scot.* vol. ii. p. 89. *Grev. Fl. Edin.* p. 312. *Harv. in Hook. Br. Fl.* vol. ii. p. 322. *Wyatt. Alg. Danm.* no. 82. *Harv. in Mack. Fl. Hib.* part 3. p. 179. *Harv. Man.* p. 36.

CLADOSTEPHUS *myriophyllum*, *Ag. Syst.* p. 169. *Ag. Sp. Alg.* vol. ii. p. 10. *Endl. 3rd Suppl.* p. 24. *Kütz. Phyc. Gen.* p. 294. t. 18. f. 1. *J. Ag. Alg. Medit.* p. 30.

CERAMIVM *verticillatum*, *DC. Fl. Fr.* vol. ii. p. 39. *Ducluz. Ess.* p. 49.

CONFERVA *verticillata*, *Lightf. Fl. Scot.* p. 984 (1777). *Huds. Fl. Ang.* p. 653. *With. Arr.* vol. iv. p. 133. *Dillw. Conf.* t. 55. *E. Bot.* t. 1718 and 2427. f. 2. *Roth. Cat. Bot.* vol. iii. p. 309.?

CONFERVA *myriophyllum*, *Roth. Cat. Bot.* vol. iii. p. 312. t. 12. f. b. (1806).

CONFERVA *ceratophyllum*, *Roth. l. c.* p. 311.

FUCUS *verticillatus*, *Wulf. Crypt.* no. 15. t. 1.

HAB. On rocks, stones and corallines, within the influence of the tide. Perennial, fruiting in winter. Very common on the British Shores.

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe, abundantly. Cape Frio, Brazil, *Tilesius*.

DESCR. *Fronde* ultra-setaceous, 3–10 inches high, irregularly dichotomous, or subtrichotomous, rigid; *branches* erecto-patent, slender, slightly incurved, furnished throughout their length, at distances of one or two lines, with whorls of short ramuli. *Ramuli* jointed, 1–2 lines long, inflexed, furnished near the apex with one or two diverging tooth-like ramelli, thus appearing forked. *Joints* about as long as broad, longitudinally striate, each stria consisting of numerous cellules. In winter most of the whorled ramuli fall away, and the surface of the frond becomes clothed with irregularly disposed, slender ramuli, densely imbricated, of less diameter than those of the summer, with joints once and half as long as broad, and bi-tri-striate. These produce an abundance of lateral, pedicellate utricles, which we regard as the proper fruit of the plant. The apices of the summer ramuli are frequently distended, and sphacelate, and contain a dark mass, which may be possibly also connected with reproduction. *Colour* dark olive.

A well known species, abundant on most of the shores of

Europe, and found according to Martius, in Brazil. It was originally described by Lightfoot, whose excellent specific name I retain in preference to that of Roth, conferred nearly thirty years subsequently, and which is universally adopted on the continent.

What are described as fruiting ramuli, and represented in our plate at fig. 6, are regarded by Italian authors, the accurate and acute Meneghini included, as a parasitical plant, which De Notaris has named *Sphacelaria Bertiana*. Meneghini in his 'Algæ Italiane e Dalmatiche' enters largely into this question, and zealously defends the parasitical theory; regarding these ramuli as analogous productions to the *Elachistea velutina*, which no one supposes to belong to the plant that it infests. The case of the so called *Sphacelaria Bertiana* is, however, widely different. Unlike the *Elachistea*, which infests more than one species of distinct genera, of a different family of Algæ from that to which it belongs; the *E. Bertiana* is only found on the *Cladostephi*; but on these it is *constantly* produced at a particular season of the year. It, moreover, has the same *structure* as their stem, and certainly is not merely *attached* to the surface, but springs from a prolongation of the peripheric cells, and above all the fruit which it bears is exactly what, from analogy, we should expect on the *Cladostephi*, and, if this be not their fruit, no other has been observed, unless the granular mass within the tips of the whorled ramuli can be called so. These facts, and others that might be adduced, compel me to form a contrary opinion to that defended by Meneghini; and in this opinion I am supported by Mrs. Griffiths, to whom I owe my first acquaintance with these fruit-bearing ramuli, and by the Rev. Mr. Berkeley whose judgment, on all such subjects, is of great authority.

Fig. 1. CLADOSTEPHUS VERTICILLATUS:—*natural size*. 2. Portion of a branch. 3. Ramuli. 4. Apex of the same. 5. *Sphacelate* apex, of another ramulus. 6. Accessory fruiting ramuli. 7. *Utricle* in situ. 8. Portion of a transverse section of the stem:—*all more or less magnified*.



PLATE CXXXVIII.

CLADOSTEPHUS SPONGIOSUS, *Ag.*

GEN. CHAR. *Fronds* inarticulate, rigid, cellular, whorled with short, jointed, subsimple ramuli. *Fructification*; ellipticle utricles, furnished with a limbus, pedicellate, borne on accessory ramuli. CLADOSTEPHUS (*Ag.*),—κλαδος, a branch, and στεφος, a crown.

CLADOSTEPHUS *spongiosus*; branches thick and clumsy; ramuli mostly simple, sometimes forked, irregularly whorled and densely imbricated.

CLADOSTEPHUS *spongiosus*, *Ag. Syst.* p. 168. *Ag. Sp. Alg.* vol. ii. p. 12. *Harv. in Hook. Br. Fl.* vol. ii. 322. *Harv. in Mack. Fl. Hib.* part 3. p. 180. *Harv. Man.* p. 36. *Wyatt, Alg. Danm.* no. 169. *J. Ag. Alg. Medit.* p. 30. *Endl. 3rd Suppl.* p. 24.

CLADOSTEPHUS *laxus*, *Fl. Dan.* t. 1955. f. 3. (?) *excl. syn.*

CONFERVA *spongiosa*, *Huds. Fl. Ang.* p. 596. *Lightf. Fl. Scot.* p. 983. *With.* vol. iv. p. 132. *Dillw. Conf.* t. 42. *E. Bot.* t. 2427. fig. 1.

FUCUS *hirsutus*, *Linn. Mant.* p. 134. *Esper*, t. 28.

HAB. On rocks and stones in the sea, between tide marks, and at a greater depth. Perennial. Winter. Common on the shores of the British Islands.

GEOGR. DISTR. Atlantic shores of Europe and North America. Mediterranean Sea. Cape Horn, *Dr. Hooker*.

DESCR. *Root* discoid. *Fronds* from three to four inches high, thicker than bristle, irregularly branched, or somewhat dichotomous, the branches flexuous, patent, thickened here and there, more or less divided, and densely clothed throughout with short jointed setaceous ramelli. *Ramelli* from half a line to a line in length, incurved, simple, or with a forked point, attenuated at the base, acute, densely crowded together in very close whorls. These ramelli are more or less deciduous in winter, at which season the frond is covered with others of less size, straighter, and perfectly obtuse, which produce the fructification. This consists of stalked, elliptical utricles, or spores, disposed along the sides of the ramelli, and either opposite to each other or irregularly scattered. Joints of the ramelli shorter than broad, dotted, composed of several layers of minute cells. *Colour* dull brown, or dirty olive green. *Substance* of the stem woody. It does not in the least adhere to paper in drying.

Cladostephus spongiosus, the earliest described species of the genus, differs from *C. verticillatus*, already figured at Pl. XXXIII., of our first volume, more by its smaller size, more clumsy and somewhat flexuous branches, and more closely imbricated ramelli, than by any more definite character. The distinction in the ra-

melli, noticed in the specific phrase by most authors, is not constant, for these are often forked in the present species, though more usually simple. The colour is darker than that of *C. verticillatus*, and, on the whole, the present is a much less elegant plant. The accessory ramelli, which constitute the *Sphacelaria Bertiana* of Italian writers, are found on this species equally as on *C. verticillatus*. The figure of Dillwyn which represents ovate capsules, discharging spores through a terminal pore, appears to be incorrect; at least, I have never seen anything similar in the multitudes of specimens which have passed through my hands.

C. spongiosus is a very common plant throughout the northern Atlantic, growing on rocks and stones between tide marks, and is also found in the Baltic and Mediterranean Seas. Dr. Hooker collected specimens at Hermite Island, Cape Horn, which offer no character by which they can be distinguished from individuals of British growth.

Fig. 1. CLADOSTEPHUS SPONGIOSUS:—*of the natural size.* 2. Apex of one of the branches. 3. Ramelli. 4. Fertile ramelli, produced in winter. 5. Spore or utricle, *in situ*:—*all more or less magnified.*



PLATE CXLII.

SPHACELARIA FILICINA, *Ag.*

GEN. CHAR. *Filaments* jointed, rigid, distichously branched, pinnated; rarely simple or subdichotomous. *Apices* of the branches distended, membranous, containing a dark granular mass. *Fructification*; elliptical *utricles* (or *spores*) furnished with a limbus, borne on the ramuli. —SPHACELARIA (*Lyngb.*), σφάκελος, *gangrene*, alluding to the withered tips of the branches.

SPHACELARIA *filicina*; frond shaggy at the base, slender, irregularly branched; branches lanceolate, erecto-patent, bi-tri-pinnate; pinnæ alternate, erect; pinnules multifid, lanceolate; axils all very acute and narrow.

SPHACELARIA *filicina*, *Ag. Syst.* p. 166. *Ag. Sp. Alg.* vol. ii. p. 22. *Harv. in Hook. Br. Fl.* vol. ii. p. 323. *Mont. Crypt. Alg.* no. 24. *Menegh. Alg. Ital. et Dalm.* p. 324. *Harv. Man.* p. 37. *J. Ag. Alg. Medit.* p. 30. *Endl. 3rd. Suppl.* p. 23. *Mont. Fl. Alg.* p. 41. *Wyatt, Alg. Danm.* n. 170.

SPHACELARIA *hypnoides*, *Grev. Scott. Crypt. Fl.* t. 348.

SPHACELARIA *simpliciuscula*, *Ag. Sp. Alg.* vol. ii. p. 31.

HALOPTERIS *filicina*, *Kütz. Phyc. Gen.* p. 292.

CERAMIIUM *filicinum*, *Gratel. Journ. Med.* vol. iv. p. 33.

HAB. On rocks and nullipores near low-water mark, and at the roots of *Laminaria*, &c. Very rare. Perennial. Fruiting in Winter. Plymouth, *Mr. Sconce*. Ilfracombe, *Mrs. Griffiths* and *Mrs. Hare*. Salcombe, *Mrs. Wyatt*. Jersey, *Miss Turner* and *Miss White*. Mount's Bay, Cornwall; and Holyhead, Anglesea, *Mr. Ralfs*. Belfast Bay, *Mr. W. Thompson*. Youghal, *Miss Ball*. Kinsale Harbour, *Dr. J. R. Harvey*.

GEOGR. DISTR. Atlantic shores of France and Spain. Mediterranean Sea.

DESCR. *Fronds* two to four inches high, slender, more or less clothed at the base with curled brown fibres, irregularly and sparingly divided; branches distichous, erect, often bearing at their summit numerous lesser branches displayed like a fan; sometimes naked, sometimes regularly pinnated throughout. *Branches* linear-lanceolate in outline, the uppermost and lowermost pinnæ generally shorter, those in the middle longer, with now and then two or three of much greater length than those immediately adjoining. *Pinnæ* alternate, erecto-patent, bi-pinnate, or tri-pinnate below, with two pinnules constantly given off from the upper side of the rachis before any issue from the lower side. *Pinnules* issuing at every second joint, very erect, at first simple and subulate, afterwards pinnato-multifid, their ultimate divisions subulate and appressed. *Fructification* produced on the young pinnules while yet simple, a single obovate *spore* forming in the axil of the pinnule. *Articulations* half as long as broad, multi-striate; the striæ less evident in the younger parts of the frond. A cross section of the stem shows four large central cells, destitute of endochrome, surrounded by numerous, coloured cellules. *Colour* a more or less greenish olive. *Substance* rigid, scarcely adhering to paper.

There are few more beautiful plants among the filiform Algae of our coasts, and not many more rare than the subject of this plate, which, though found in several distant localities is nowhere abundant in Britain. It is, indeed, a species of the south of Europe which finds its northern limit in our seas, where it does not reach much more than half the size that it attains in the Mediterranean. Specimens from the shores of Italy are nearly as large and bushy as *S. scoparia*, but much more slender in all their parts. Our British individuals, except those from Jersey, are so feeble, and have so different an aspect, that Dr. Greville, who first figured them in his beautiful Cryptogamic Flora, regards them as belonging to a different and peculiar species, which he calls *S. hypnoides*. A careful comparison with numerous continental specimens from various quarters has led me to an opposite conclusion, the differences appearing to me to be merely such as may be fairly referred to climate. The Mediterranean specimens of *Grateloupia filicina* are quite as unlike the British ones as those of the Mediterranean *Sphacelaria filicina* are to ours. There is no difference in the microscopic characters of the ramuli, or in their disposition, if the specimens have respectively been collected at the same season. Between the winter and summer states of this species, however, the differences are so great, that Agardh formerly constituted them two species, his *S. simpliciuscula*, which has its pinnules subsimple, being the winter state of *S. filicina*. A similar difference between the summer and winter appearance of *S. scoparia* has already been pointed out. Indeed, so great is the variableness of aspect which specimens at different ages present, among the *Sphacelariæ*, that, as Meneghini well remarks, the greatest caution should be exercised by authors who propose new species; and the plants should be watched in their place of growth from their first appearance to maturity. But this is often no easy matter, especially with such rare plants as the present. Since our plate has been prepared Miss Turner has communicated from Jersey a magnificent specimen, fully as large as one from the south of Europe, and covered with fructification. I regret that it is too late to add a representation of the spore to the analysis already given.

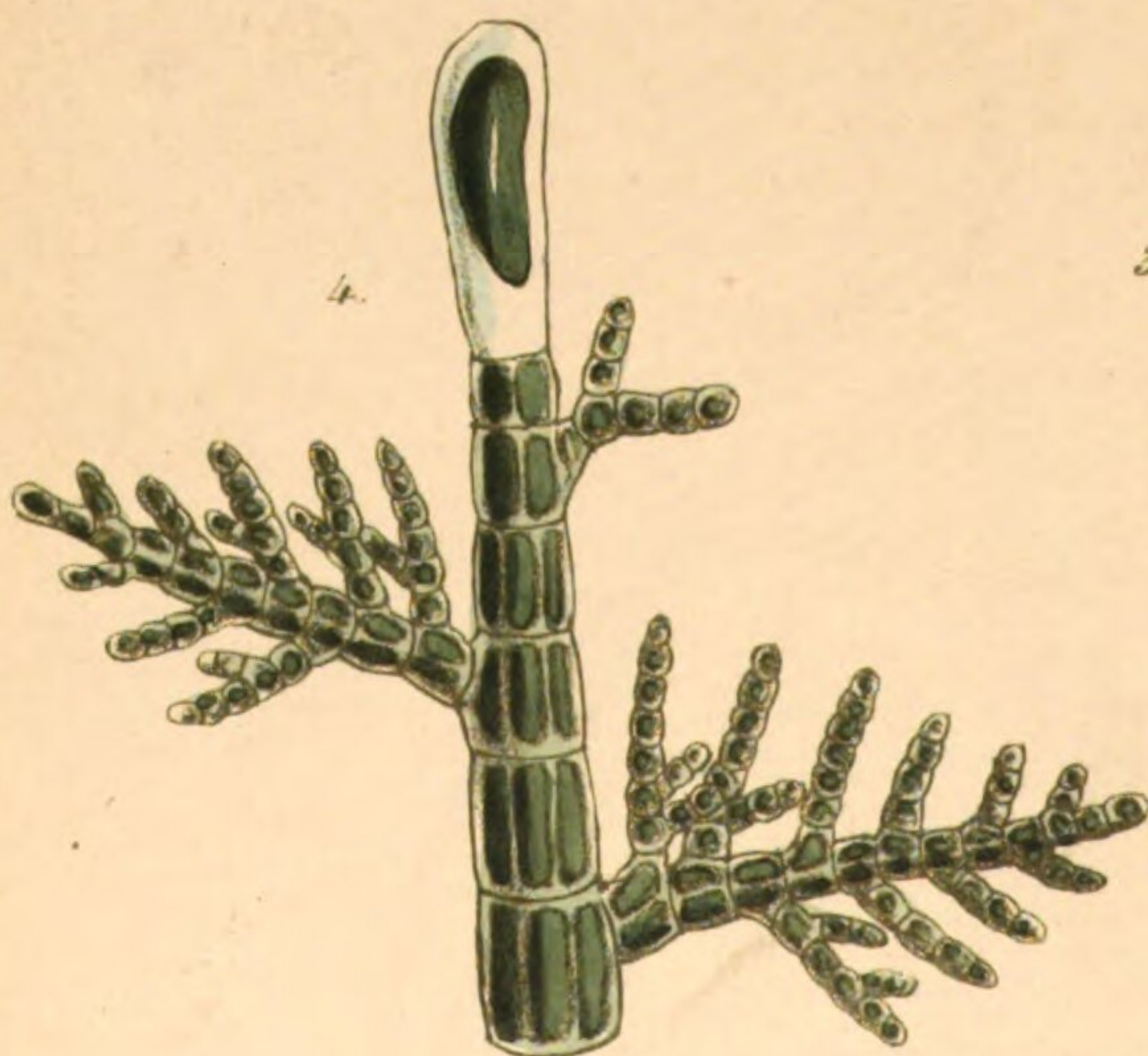
Fig. 1. SPHACELARIA FILICINA:—*the natural size*. 2. A branch. 3. A pinna.
4. Cross section of the stem.



1.



2.



4.



3.

PLATE CXLIII.

SPHACELARIA SERTULARIA, *Bonnem.*

GEN. CHAR. *Filaments* jointed, rigid, distichously branched, pinnated; rarely simple or subdichotomous. *Apices* of the branches distended, membranous, containing a dark, granular mass. *Fructification*; elliptic *utricles* (or *spores*) furnished with a limbus, borne on the ramuli. SPHACELARIA (*Lyngb.*),—from σφεκαλος, *gangrene*, alluding to the withered tips of the branches.

SPHACELARIA *Sertularia*; frond slightly shaggy at the base, weak and slender, irregularly branched; branches somewhat lanceolate or linear horizontally patent, tripinnate; pinnæ alternate, divaricate; pinnules very patent, multifid; axils all very obtuse and wide.

SPHACELARIA *Sertularia*, *Bonnem. sec. Lenorm. in Herb.*

SPHACELARIA *filicina* β. *patens*, *Harv. Man. p. 37.*

HAB. Parasitical on various Algæ, in from four to fifteen fathoms water. Very rare. Perennial. Brighton Beach, *Mr. Borrer*. Torbay, and other places on the South Coast, *Mrs. Griffiths*. Isle of Wight, *Miss Kirkpatrick*. Jersey, *Miss H. M. White*. Carrickfergus, *Mr. M'Calla*. Roundstone Bay, *W.H.H.*

GEOGR. DISTR. Atlantic shores of France, South of England, and Ireland.

DESCR. *Fronde*s about an inch, rarely two inches high, very slender, growing in irregular, somewhat matted patches or tufts, among the branches of other Algæ, more or less connected at base by curled brown fibres, more or less regularly pinnate, or somewhat naked below and producing at the apex numerous branches spreading like a fan. *Branches* linear, linear-lanceolate, or oblong, closely tripinnate throughout, the pinnæ very unequal in length, long and short ones sometimes alternating; at other times most of the central pinnæ are of equal length, those near the top and bottom being much shorter. *Pinnæ* horizontally patent, alternate, bipinnate below, more or less tripinnate above, the two lowermost pinnæ given off from the upper side of the rachis before any issue from the lower. *Pinnules* issuing at every second joint, horizontally patent or divaricate, pinnato-multifid, their ultimate divisions linear, obtuse, patent. *Articulations* about as long as broad, 3-4-striate, the striæ less numerous in the younger parts; the ultimate ramuli mono-siphonous. *Colour* an olive-green. *Substance* rigid, scarcely adhering to paper. The apices of the branches are frequently much produced, sphacelate, containing a dark coloured granular mass.

It is, I allow, with some hesitation that I offer a figure of the present plant as anything more than a deep-water variety of *Sphacelaria filicina*, analogous to somewhat similar varieties of several other Algæ, individuals of which, when growing at a more

than ordinary depth differ as much from their normal state, and in a very similiar manner, as the present does from *S. filicina*. Persons accustomed to dredging must be familiar with states of *Plocamium coccineum*, *Dasya coccinea*, &c., which are more slender than the normal form, irregularly branched, with very patent branches and ramuli, and which are usually found entangled with other Algæ, to which they are attached by hooked processes, different from their true roots. The plant here figured has always appeared to me to be a similiar state of *S. filicina*, nor am I yet convinced that it ought to be regarded as any thing more. Other observers are, however, of a different opinion, and among them Mrs. Griffiths, who has repeatedly gathered both plants, and considers the constantly parasitic habit of the *S. Sertularia*, its small size, and very patent branching, to afford sufficient distinctions. In the plate here given I have taken pains to represent all these characters in sufficient detail to be readily contrasted with *S. filicina* figured in the last plate, and having done so I must submit the decision to the judgment of my fellow students. At any rate there are quite differences enough to constitute an excellent "*cabinet species*".

I am not aware in what work Bonnemaison has published this plant. My knowledge of his synonyme is due to M. Lenormand who has obligingly communicated a specimen from the north of France under the name here adopted, and who informs me that it is frequently cast on the French coast entangled with the uncinate variety of *Plocamium coccineum*.

Fig. 1. SPHACELARIA SERTULARIA; *of the natural size*. 2. A branch. 3. A pinna. 4. Apex of a pinna, with some of the smaller pinnules.



PLATE XXXVII.

SPHACELARIA SCOPARIA, *Lyngb.*

GEN. CHAR. *Filaments* jointed, rigid, distichously branched, pinnated; rarely simple or subdichotomous. *Apices* of the branches distended, membranous, containing a dark granular mass. *Fructification*; elliptical *utricles*, furnished with a limbus, borne on the ramuli. SPHACELARIA (*Lyngb.*)—from σφάκελος, *gangrene*, alluding to the *withered* tips of the branches.

SPHACELARIA *scoparia*; olive or dark brown, coarse, the lower part shaggy with woolly fibres; upper branches once or twice pinnated; the pinnæ erecto-patent, awl-shaped, alternate, the lower ones pinnulate.

SPHACELARIA *scoparia*, *Lyngb. Hyd. Dan.* p. 104. t. 31. *B. Ag. Syst.* p. 167. *Ag. Syst. Alg.* vol. ii. p. 19. *Grev. Fl. Edin.* p. 313. *Harv. in Hook. Br. Fl.* vol. ii. p. 323. *Harv. in Mack. Fl. Hib.* part 3. p. 180. *Harv. Man.* p. 37. *Wyatt. Alg. Danm.* no. 361. *Ag. Alg. Medit.* p. 29. *Endl. 3rd Suppl.* p. 23. *Meneg. Alg. Ital. et Dalm.* p. 344.

SPHACELARIA *disticha*, *Lyngb. l. c.* p. 104. t. 31. *A. Ag. Sp. Alg.* vol. ii. p. 26. *Harv. in Hook. Br. Fl.* vol. ii. p. 323.

SPHACELARIA *scoparioides*, *Lyngb. l. c.* p. 107. t. 32. *C. Ag. Syst.* p. 165.

CERAMIMUM *scoparium*, *Roth. Cat. Bot.* vol. iii. p. 141. *Ag. Syn. Hook. Fl. Scot.* part. 2. p. 86.

CONFERVA *scoparia*, *Linn. Syst. Nat.* vol. ii. p. 720. *Huds. Fl. Angl.* p. 595. *Lightf. Fl. Scot.* p. 981. *With.* vol. iv. p. 131. *Dillw. Conf.* t. 52. *E. Bot.* t. 1552.

CONFERVA *marina pennata*, *Dillen.* t. 4. f. 23.

STYPOPODIUM *scoparium*, *Kütz. Phyc. Gen.* p. 293. t. 18. f. 2.

HAB. On submerged rocks, within and beyond the influence of the tide. Generally distributed along the coasts of the British Islands; most common in the south.

GEOGR. DISTR. Atlantic coasts of Europe from Norway to Spain. Baltic and Mediterranean Seas. Canary Islands, *Webb.* Cape of Good Hope, *W. H. H.*

DESCR. *Root*, and lower part of the stems invested with a thick coating of woolly fibres. *Stems* 2–4 inches high or more, shaggy, robust, either much and irregularly divided, or subsimple, densely set with quadrifarious, pinnate or bi-pinnate branches, which spread from the summits of the main divisions in broad, brush-like, rigid tufts. *Pinnæ* either short, simple, and spine-like or elongated, and again pinnulate. *Joints* longitudinally striate. A *section* of the stem and its accessory fibres (fig. 5), exhibits an elegant lace-work of square cellules in the centre of the stem, and of each separate fibre.

So different from each other are the summer and winter states

of this plant that the accurate Lyngbye may well be forgiven for considering them to be distinct species. Few persons on inspection of our plate, would suppose that the bushy and broom-like upper figure, was identical in species with the feathery plant represented below; even their microscopic characters are widely dissimilar. Yet, observation, the true test of species, has traced the one form into the other; and I possess a suite of specimens communicated by Miss Cutler and Mrs. Griffiths, which clearly demonstrate the transition.

Sphacelaria scoparia has been long known to botanists, having been noticed by Bauhin, and figured by Dillenius in his admirable work. It is very common on the several coasts of Europe, both Atlantic and Mediterranean, and probably extends to other tropical shores besides those of the Canary Islands. I have gathered it in two localities at the Cape of Good Hope. Further south, its place is taken by an analogous form (*S. funicularis*, Mont.), which is found at the Auckland Island, and in New Zealand, in which Island some other remarkable *Sphacelariæ* occur. Of these the most curious is *S. hordeacea*, whose branches are tipped with spikes of utricles, subtended by ramuli, and closely resembling miniature ears of barley. Other species of the genus inhabit every zone, from North Cape to Cape Horn; but tropical algæ have been, as yet, so imperfectly investigated, that it is premature to assert to which zone the maximum of the genus belongs. At present the evidence is in favour of the temperate zones of the northern hemisphere.

Professor Kützing has, in his 'Phycologia Generalis,' constituted *S. scoparia* the type of a distinct genus, and *S. filicina* that of another. The grounds of such separation are, in my opinion, very insufficient to warrant the dismemberment of so natural and well defined a group as the *Sphacelariæ* of Lyngbye appear to be.

Fig. 1. SPHACELARIA SCOPARIA; in summer:—*natural size*. 2. Branchlet of the same:—*magnified*. 3. *S. scoparia*; in winter:—*natural size*. 4. Branchlet of the same. 5. Cross section of the stem, surrounded by accessory fibres:—*magnified*.

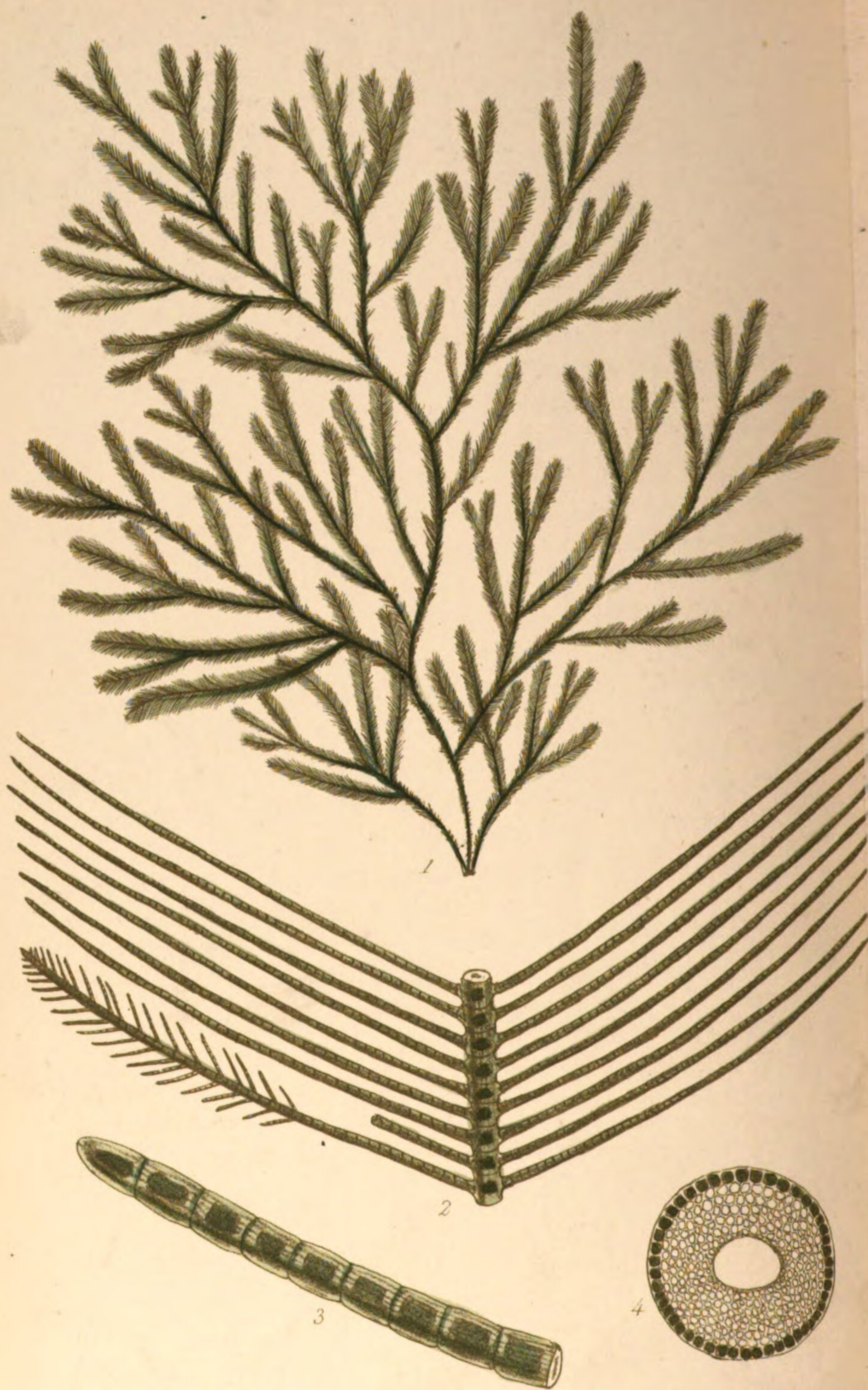


PLATE LXXXVII.

SPHACELARIA PLUMOSA, *Lyngb.*

GEN. CHAR. *Filaments* jointed, rigid, distichously branched, pinnated; rarely simple, or subdichotomous. *Apices* of the branches distended, membranous, containing a dark, granular mass. *Fructification*; elliptical *utricles*, furnished with a limbus, borne on the ramuli. SPHACELARIA (*Lyngb.*),—from σφάκελος, *gangrene*, alluding to the withered tips of the branches.

SPHACELARIA *plumosa*: filaments naked at the base, elongated, irregularly branched, inarticulate; branches pectinato-pinnate; pinnæ opposite, simple, very long and closely set.

SPHACELARIA *plumosa*, *Lyngb. Fl. Dan.* p. 103. t. 30. *Ag. Syst. Alg.* p. 166. *Ag. Sp. Alg.* vol. ii. p. 24. *Grev. Fl. Edin.* p. 313. *Harv. in Hook. Brit. Fl.* vol. ii. p. 324. *Harv. in Mack. Fl. Hib.* part iii. p. 180. *Harv. Man.* p. 38. *Wyatt, Alg. Danm.* no. 300. *Endl. 3rd Suppl.* p. 23.

CHÆTOPTERIS *plumosus*, *Kütz. Phyc. Gen.* p. 293.

CERAMIVM *pennatum*, *Fl. Dan.* t. 1481. *Roth. Cat. Bot.* vol. iii. p. 133. *Ag. Syn.* p. 68.

CONFERVA *pennata*, *Sm. E. Bot.* t. 2330 (*the left hand figure*).

HAB. On rocks, near low-water mark, and at a greater depth. Perennial. Beachy Head, *Mr. Borrer*. Frith of Forth, *Sir J. Richardson and Dr. Greville*. Wicklow, *W. H. H.* Belfast Bay, *Mr. W. Thompson*. Near Caernarvon, also at Ilfracombe, and Land's end, *Mr. Ralfs*. Howth and Balbriggan, *Miss Gower*. Orkney, *Rev. J. H. Pollexfen*. Kilbride, *Major Martin*.

GEOGR. DISTR. German Ocean, along the shores of Denmark and Norway. Baltic Sea. Greenland, *Fabricius (see Lyngb.)*.

DESCR. *Root* minute, scutate. *Fronds* tufted, from two to four or six inches in length, setaceous, naked below, irregularly much branched above. *Branches* alternate or secund, or frequently fasciculate, several growing from the wounded apex of an older branch, one or two inches long, simple, erectopate, closely pectinate throughout their whole length with slender articulated ramuli. *Ramuli* patent, from one to three lines in length, opposite, issuing from every joint of the branches, parallel to each other, and of equal length, either quite simple or occasionally pectinato-pinnate in their upper half. *Apices* of the branches frequently sphacelate. *Main stem* opaque, not obviously jointed; branches more translucent, jointed, the joints shorter than their breadth, longitudinally striate, and marked with a dark-coloured spot; joints of the ramuli about once and a half as long as broad, similarly marked. *Colour* olivaceous, or occasionally rusty. *Substance* rigid, not adhering to paper in drying.

By earlier writers this beautiful species was confounded with

S. cirrhosa, of which it was considered to be a luxuriant variety, and in 'English Botany' both are represented on the same plate. Mr. Borrer was, I believe, its first detector in this country, and I am indebted to him for one of the original specimens, gathered at Beachy head. From *S. cirrhosa* it may always be known, by the different structure of the stem, the closer and more regularly pectinated ramuli, and the greater size.

S. plumosa appears to be peculiarly a northern plant, for though first observed on the south coast of England, it is by no means common there, nor are the specimens more than half the size of that represented in our plate. Further north, it is much more frequently met with, and becomes much more luxuriant. Our figure is taken from a Welsh specimen, and those collected by Sir. J. Richardson, at Colvend, in Dumfriesshire, are still more beautifully feathered with long ramuli. The Continental stations are all, it will be observed, from the north of Europe. I am not aware of its being found on the French coast.

In substance and general habit, *S. plumosa* has very much the appearance of a *Sertularia*, and is almost as rigid. By Professor Kützinger it is made the type of a separate genus, on account of the structure of its stem being a little different from that of the typical species; but the difference does not appear to me to be sufficiently great to warrant the dismemberment of so natural a group, unless it were further borne out by a difference in fructification. But the fructification of this, as well as of several others of the *Sphacelariæ*, is unknown.

Fucus rudis of Esper (Ic. Fuc. t. 27), which is said to be a native of the shores of England and France, is referred by Lyngbye to *Sphacelaria plumosa*, but if intended for this plant it is indeed a very *rude* representation of it. Esper's figure much more nearly resembles a faded piece of *Ballia Brunonis*, a native of the Southern Ocean; but is said to have been drawn from a specimen received from Normandy.

Fig. 1. SPHACELARIA PLUMOSA :—of the natural size. 2. Segment of a branch.
3. Portion of one of the pectinate ramuli. 4. A cross section of the stem:
—all more or less highly magnified.



PLATE CLXXVIII.

SPHACELARIA CIRRHOSA, *Ag.*

GEN. CHAR. *Filaments* jointed, rigid, distichously branched, pinnated; rarely simple or subdichotomous. *Apices* of the branches distended, membranous, containing a dark, granular mass. *Fructification*; elliptical *utricles* (or *spores*), borne on the ramuli. SPHACELARIA (*Lyngb.*), from σφακελος, *gangrene*, alluding to the withered tips of the branches.

SPHACELARIA *cirrrosa*; parasitical; filaments naked at the base, short, densely tufted, simple or branched, jointed throughout; stem, or branches, pinnate; pinnæ opposite, alternate, or irregular, of unequal length; utricles sessile or shortly stalked, scattered, globose.

SPHACELARIA *cirrrosa*, *Ag. Syst. Alg.* p. 164. *Ag. Sp.* vol. ii. p. 27. *Harv. in Hook. Br. Fl.* vol. ii. p. 324. *Wyatt, Alg. Danm.* no. 171. *Harv. in Mack. Fl. Hib.* part 3. p. 180. *Harv. Man.* p. 38. *J. Ag. Alg. Medit.* p. 29. *Endl. 3rd Suppl.* p. 24. *Grev. Crypt.* t. 317. *Kg. Phyc. Gen.* p. 292.

SPHACELARIA *pennata*, *Lyngb.* p. 105. t. 31. (excl. var. β.)

CERAMIUM *cirrhosum*, *Hook. Fl. Scot.* part 2. p. 86.

CONFERVA *marina perbrevis villosa et cirrhosa*, *Dill. Musc.* t. 4. f. 21.

CONFERVA *cirrrosa*, *Roth. Cat.* vol. ii. p. 214. vol. iii. p. 294.

CONFERVA *intertexta*, *Roth. Cat.* vol. i. p. 188. t. 3. f. 5.

CONFERVA *pennata*, *Huds.* p. 604. *Dillw.* t. 86. *E. Bot.* t. 2330 (*right-hand figure*). *Fl. Dan.* t. 1486. f. 2.

HAB. Parasitic on the smaller Algæ, between tide marks. Perennial? Summer. Very common.

GEOGR. DISTR. Abundant on the Atlantic and Mediterranean shores of Europe.

DESCR. *Filaments* from a quarter of an inch to one or two inches in length, slender, forming globose, dense tufts, very variable in the amount of ramification. Some of the smaller varieties are but slightly branched, the branches irregularly pinnate. In others the main filament is repeatedly divided, the branches closely set, spreading, short in the lower part of the frond, elongated above, once or twice pinnate. *Pinnæ* closely set, opposite or alternate, erect or spreading, mostly simple and naked, sometimes pinnulated, very irregular in length, but gradually becoming shorter to the tips, slightly tapering. *Apices* frequently sphacelate. *Joints* visible in all parts of the stem and branches, at distances asunder equal to about the diameter of the frond, longitudinally striate. *Utricles* globose, scattered along the pinnæ, either sessile or raised on short stalks. *Colour* olive; becoming a foxy brown in age. *Substance* rigid, not adhering to paper in drying.

Here we have a very common and very variable plant, which puts on several distinct looking forms, according to the locality

in which it may grow ; but, on a careful examination of numerous specimens of these varieties now before me, I cannot fix on any characters which appear of specific value. My friend Mr. Hore finds that the utricles or spores of the small variety which commonly grows on *Desmarestia aculeata* are borne on little stalks, while in the common form represented in our plate they are mostly sessile ; and this character, were it constant, would afford a readily appreciable mark of distinction. But when making the sketch for the magnified ramulus (fig. 4) taken, without selection, from a specimen of the common form, I observed that though the spores are often nearly sessile, there is frequently a short pedicel. And when any disposition to form a pedicel exists in so variable a plant as this, its amount must be most uncertain. The spore is to be regarded morphologically as an abbreviated ramulus ; where the *whole* ramulus is converted into a spore, that organ will be sessile ; but when a part only is so changed, it will be stalked.

This species was once confounded with *S. plumosa*, but differs from that beautiful plant in habit and size, in its jointed main filaments, and in being far less regularly pectinato-pinnated, with proportionally shorter pinnules. Being a very common plant, it was among the first of the genus observed by botanists, and is figured in the *Historia Muscorum* of Dillenius, under the specific name here preserved. By Hudson it was subsequently called *pennata*, a name adopted by succeeding authors until the older one was restored by Roth.

Fig. 1. SPHACELARIA CIRRHOSA ; tufts :—*of the natural size*. 2. Part of the stem and pinnated branches. 3. Apex of a branch with ramuli. 4. Ramulus with utricles.



PLATE CXLIX.

SPHACELARIA FUSCA, *Ag.*

GEN. CHAR. *Filaments* jointed, rigid, distichously branched, pinnated; rarely simple or subdichotomous. *Apices* of the branches distended, membranous, containing a dark granular mass. *Fructification*; elliptical *utricles* (or *spores*), borne on the ramuli. SPHACELARIA (*Lyngb.*), —from σφακελος, *gangrene*, alluding to the withered tips of the branches.

SPHACELARIA *fusca*; filaments densely tufted, capillary, brown, distantly and irregularly branched; branches long and simple, bearing a few clavate or three-forked, minute ramuli; articulations twice as long as broad, marked by a transverse band; spores globose.

SPHACELARIA *fusca*, *Ag. Sp. Alg.* vol. ii. p. 34. *Harv. in Hook. Br. Fl.* vol. ii. p. 324. *Harv. Man.* p. 38.

CONFERRA *fusca*, *Huds. Fl. Ang.* p. 602. *With.* vol. iv. p. 141. *Dillw. Conf.* t. 95.

HAB. On rocks and stones, between tide marks. Very rare. Anglesea, *Rev. Hugh Davies*. Newton Nottage, Glamorgan, *Mr. W. W. Young*. Worms Head, and other places in Gower, *Mr. Dillwyn*. Sidmouth, *Mrs. Griffiths*. St. Michael's Mount, Cornwall, *Mr. Ralfs*.

GEOGR. DISTR. Shores of Wales and South of England.

DESCR. *Fronde*s one to two inches high, forming dense pencilate tufts, very slender, irregularly branched in an alternate or spuriously dichotomous manner; branches often secund, very erect, long and simple, of equal diameter throughout. *Ramuli* very few, scattered, minute, attenuate at the base, club-shaped, or furnished immediately below the apex with three, divergent, thorn-like, somewhat horizontal processes. *Articulations* about twice as long as broad, composed of several cells, and marked with a brown transverse band in the centre. *Spores*, according to Dillwyn, globose, scattered, sometimes stalked. *Substance* rigid, not adhering to paper. *Colour* a dark chesnut brown.

Dillwyn, on whose authority the *Sphacelaria fusca* chiefly rests, gives several stations for it, on the coast of Wales, where it would seem to be pretty common. But except a single specimen sent to me several years ago by Mrs. Griffiths, and another more recently received from Mr. Ralfs, I have seen nothing of the plant; nor am I aware of any other author having found it. It may or may not be the *Conferva fusca* of Hudson, whose

account is too brief to form a decided opinion upon. Never having seen a specimen of Mr. Dillwyn's plant, I am not even sure of his synonym, though the magnified portion of his figure is sufficiently like the specimen I have drawn from. Still, his saying that the plant is "from three to five inches long," a size greatly above that of my specimen, throws a doubt on the reference.

As a species, *S. fusca* (or what I take for it) will rank next *S. cirrhosa*, from which it differs by its irregular branching, by the remarkable cruciform scattered ramuli, and something in colour and in the length of the joints. *S. cirrhosa* is parasitical on other Algæ; but too little is yet known of the history of *S. fusca* to say that it is *not* so. No foreign author appears to be acquainted with the plant; Agardh having adopted it on the authority of Dillwyn's figure.

Fig. 1. SPHACELARIA FUSCA: a tuft:—*of the natural size*. 2. A filament. 3. Portion of the same, with one of the three-forked ramuli:—*both magnified*.

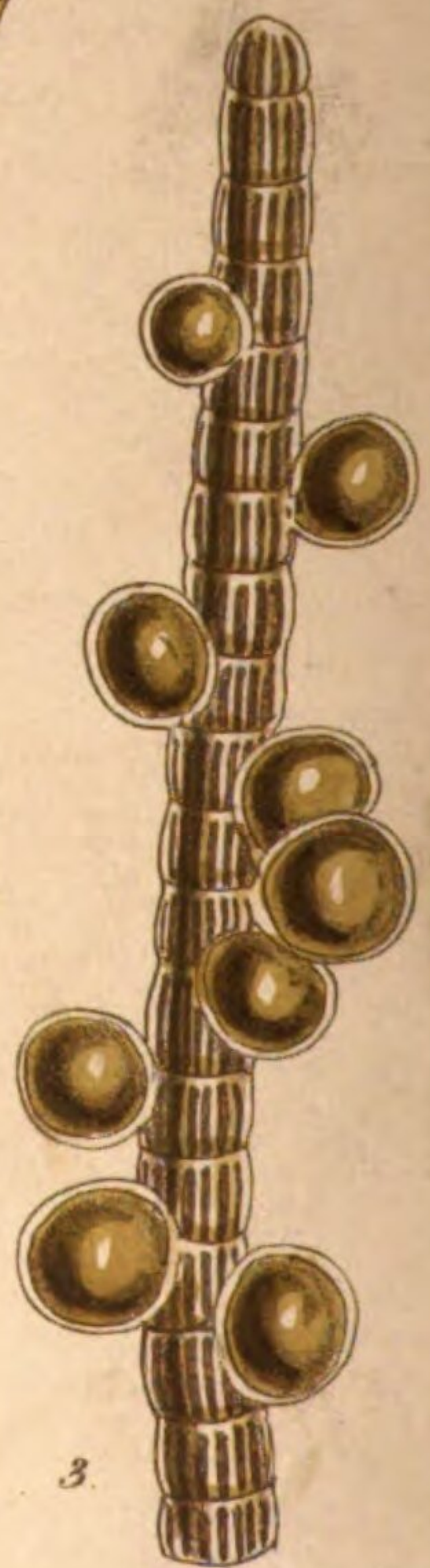


PLATE CLXXXIX.

SPHACELARIA RADICANS, *Harv.*

GEN. CHAR. *Filaments* jointed, rigid, distichously branched, pinnated; rarely simple or subdichotomous. *Apices* of the branches distended, membranous, containing a dark, granular mass. *Fructification*; elliptical *utricles* (or *spores*) furnished with a limbus, borne on the ramuli. SPHACELARIA (*Lyngb.*),—from σφακελος, *gangrene*, alluding to the withered tips of the branches.

SPHACELARIA *radicans*; filaments erect, or decumbent, sending out a few fibrous radicles from the lower part, sparingly branched; branches alternate, simple, very erect, straight, bare of ramuli; utricles clustered, sessile, globose.

SPHACELARIA *radicans*, *Harv. in Hook. Br. Fl.* vol. ii. p. 324. *Harv. in Mack. Fl. Hib.* part 3. p. 181. *Harv. Man.* p. 39. *Wyatt, Alg. Danm.* no. 210.

SPHACELARIA *cirrhosa*, ζ *simplex*, *Ag. Sp. Alg.* vol. ii. p. 29.

SPHACELARIA *olivacea*, *Ag. Sp. Alg.* vol. ii. p. 30. *Harv. in Hook. Br. Fl.* vol. ii. p. 324. *Harv. in Mack. Fl. Hib.* part 3. p. 181. *Harv. Man.* p. 39. *Kütz. Phyc. Gen.* p. 292. *Endl. 3rd Suppl.* p. 24.

CONFERVA *radicans*, *Dillw. Supp.* p. 57. t. C. *E. Bot.* t. 2138.

CONFERVA *olivacea*, *Dillw. Sup.* p. 57. t. C. *E. Bot.* t. 2172. *Hook. Fl. Scot.* part 2. p. 83.

HAB. On sand-covered rocks, between tide marks. Perennial? Autumn. Rare. Bantry, *Miss Hutchins.* Dunmore, Waterford, *Miss A. Taylor.* Orkney, *Messrs. Hooker and Borrer.* Appin, *Capt. Carmichael.* Torbay, *Mrs. Griffiths.* Ilfracombe, Land's End, and Mount's Bay, *Mr. Ralfs.*

GEOGR. DISTR. Iceland. Baltic Sea. Heligoland, *Binder!* Coast of France, *Chauvin!*

DESCR. *Root*, decumbent, irregularly branched fibres, matted together. *Filaments* capillary, from half an inch to an inch in length, erect, or decumbent, forming dense, irregular tufts spreading over the rocks in patches of various extent, seldom fastigate; generally, owing to the unequal height of the filaments, having a ragged appearance. *Branches* few, irregular, either alternate or secund, straight, simple, very erect, destitute of ramuli, but frequently emitting root-like fibres from their lower part, articulated throughout. *Articulations* rather shorter than the diameter, longitudinally striate. *Apices* obtuse, seldom sphacelate. *Utricles*, or *spores*, abundantly produced along the sides of the upper branches, globose, scattered or clustered together, sessile, with a narrow pellucid border, and containing a dark sporaceous mass. *Colour* a dull greenish olive, preserved in drying. *Substance* rigid, rather harsh, not adhering (or but very slightly) to paper, dull, and without gloss.

A minute species, one of the least developed of the genuine members of the genus, and more remarkable for its rarity than its beauty. It was originally discovered in the neighbourhood of Bantry, by the late Miss Hutchins, and first described and figured in the appendix to Dillwyn's *Confervæ*. About the same time specimens slightly differing in character, were gathered in Orkney by Messrs. Hooker and Borrer, and received the name of *olivacea*: and thus two species have generally been recognised. A careful comparison of the characters attributed to each, with an examination of specimens from several localities, has satisfied me that the differences do not warrant the retention of two species, and I consequently here unite the *S. olivacea* of authors, to the older *S. radicans*. The form to which the name *olivacea* was given, is rather more erect, and less disposed to throw out radicles than common; but there are no other characters by which it can be distinguished. I speak of the *S. olivacea* of British authors; the plant so called by Lyngbye appears to be somewhat different, and is either a distinct species or a state of *S. cirrhosa*.

Fig. 1. Tufts of SPHACELARIA RADICANS:—*of the natural size.* 2. Filaments:—*magnified.* 3. Apex of a fertile branch:—*more highly magnified.*

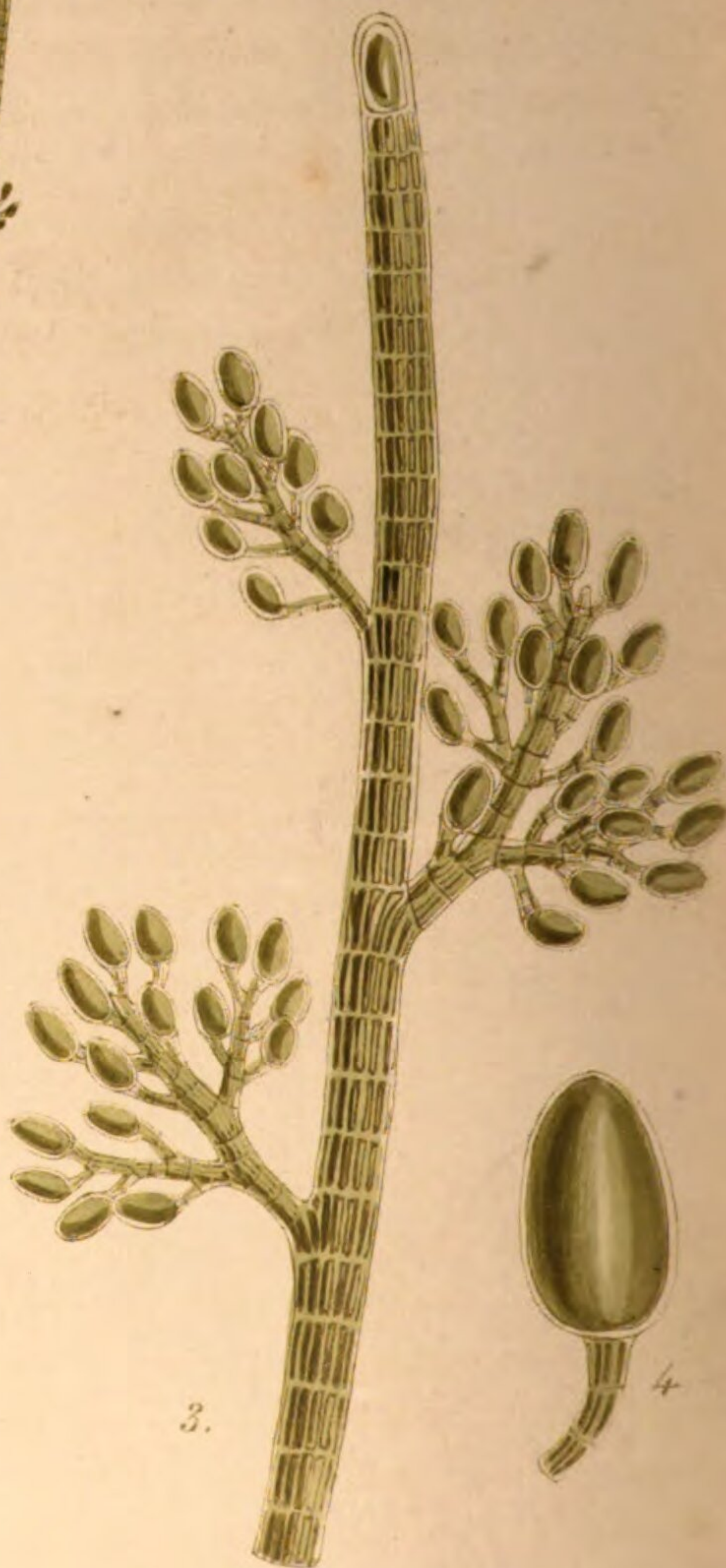


PLATE CCCXLIX.

SPHACELARIA RACEMOSA, *Grev.*

GEN. CHAR. *Filaments* jointed, rigid, distichously branched, pinnated; rarely simple or subdichotomous. *Apices* of the branches distended, membranous, containing a dark, granular mass. *Fructification*, elliptical *utricles* (or *spores*), borne on the ramuli. SPHACELARIA (Lyngb.), —from σφακελος, *gangrene*, alluding to the withered tips of the branches.

SPHACELARIA *racemosa*; “an inch in height, tufted, olivaceous, somewhat rigid, the fronds dichotomous; articulations equal in length and breadth; capsules oval, racemose, pedunculate.” *Grev.*

SPHACELARIA *racemosa*, *Grev. Scot. Crypt. Fl.* vol. ii. t. 96. *Grev. Fl. Edin.* p. 314. *Harv. in Hook. Br. Fl.* vol. ii. p. 325. *Harv. Man.* ed. 1. p. 39. ed. 2. p. 57. *J. Ag. Sp. Alg.* vol. i. p. 31. *Kütz. Sp. Alg.* p. 466.

HAB. In tide-pools? Very rare. Frith of Forth, opposite to Caroline Park, *Sir John Richardson*.

GEOGR. DISTR. Only found in the above locality, and there only once (about the year 1821).

DESCR. “*Plant* tufted, about an inch in height, of an olive-green or olive-brown colour. *Frond* filiform, somewhat rigid, 3–4 times dichotomous, the dichotomies acute. *Articulations* equal in length and breadth, diaphanous to the base. *Summits* of the branches not sphacelated in my specimens, but somewhat dilated and hyaline, as in many other species previous to the sphacelation making its appearance. *Fructification*, oval capsules, surrounded by a very narrow pellucid border, pedicellate, and arranged in a racemose manner, on a common jointed peduncle. *Racemes* suberect, arising from various parts of the frond.”—*Grev. Scot. Crypt. l. c.*

In this species we have the remarkable fact, occasionally met with in all departments of natural history, of a species distinguished by strongly marked characters having been seen but once, and that in very small quantity. The tuft from which Dr. Greville's figure, and the above description, which I have transferred from his work, were taken, has also served me in making the drawing for the plate now given, having been kindly placed in my hands for that purpose by Dr. Greville, with the liberal per-

mission to abstract a fragment of the precious relic, to be preserved in the Dublin Herbarium. The singular grape-like fructification at once marks the species, and on the specimen found almost every thread had more or less numerous clusters. So that it fortunately happens, that a small specimen of this rarity is as characteristic as a much larger would be,—no small advantage, when a half-crown would cover all the specimens at present known to botanists. Dr. Greville has repeatedly sought it in vain in the spot on which the solitary tuft was picked up by Sir J. Richardson, previous to his first and memorable Arctic Voyage.

Fig. 1. Tuft of SPHACELARIA RACEMOSA :—*the natural size*. 2. Upper portion of a frond :—*magnified*. 3. Apex of a branch, with branches of spores ; and 4, one of the pedicellate spores :—*more highly magnified*.



PLATE CLXII.

ECTOCARPUS SILICULOSUS,* *Lyngb.*

GEN. CHAR. *Fronde* capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit* either spherical, elliptical, or lanceolate *utricles* (or *spores*), borne on the ramuli, or imbedded in their substance. ECTOCARPUS (*Lyngb.*),—from *εκτος*, *external*, and *καρπος*, *fruit*.

ECTOCARPUS *siliculosus*; tufts yellowish or pale olive green, gelatinous, soft; filaments very slender, excessively branched; ultimate branchlets alternate or secund, attenuated; utricles stalked, subulate, attenuated to a fine point.

ECTOCARPUS *siliculosus*, *Lyngb. Hyd. Dan.* p. 131. t. 43. *Ag. Syst.* p. 161. *Grev. Fl. Edin.* p. 314. *Ag. Sp. Alg.* vol. ii. p. 37. *Harv. in Hook. Br. Fl.* vol. ii. p. 325. *Harv. in Mack. Fl. Hib.* part 3. p. 181. *Harv. Man.* p. 40. *Wyatt, Alg. Danm.* no. 172. *J. Ag. Alg. Medit.* p. 26. *Endl. 3rd Suppl.* 21. *Kütz. Phyc. Gen.* p. 288.

CERAMIUM *siliculosum*, *Ag. Syn.* p. 65. *Hook. Fl. Scot.* part 2. p. 86.

CERAMIUM *confervoides*, *Roth, Cat.* vol. i. p. 151. t. 8. f. 3. and vol. iii. p. 148.

CONFERVA *siliculosa*, *Dillw. Syn.* no. 112. t. E. *Sm. Eng. Bot.* t. 2319.

β. longipes; stalks of the utricles very long.

HAB. Parasitical on various marine Algæ, between tide marks, and in three to four fathom water. Annual. Spring to Autumn. Very common. *β.* at Jersey, *Miss White*.

GEOGR. DISTR. Atlantic shores of Europe and North America. Mediterranean Sea.

DESCR. *Filaments* from three to eighteen inches long, densely tufted and excessively branched, very slender, the main branches more or less entangled together, in old specimens especially, into slender rope-like bundles, the lesser branches free, spreading on all sides, long, and set with feathery branchlets furnished with lateral byssoid ramuli. *Branches* and *ramuli* alternate, or subsecund, issuing at acute angles; the latter long, and tapering to a point. *Joints* from once and a half to twice as long as broad, pellucid. *Utricles* broadly subulate, or somewhat lanceolate, closely transversely striate, tapering to a fine point, and occasionally produced at the apex into a hyaline filament. In our var. *β.* (fig. 4, 5.) the utricles are borne on very long stalks, but not otherwise different. *Substance* very soft, somewhat gelatinous, soon decomposing, closely adhering to paper in drying; sometimes more harsh and coarser. *Colour* varying from olive green to yellowish or brown.

This is one of the commonest species of *Ectocarpus* in the

* Erroneously printed *reticulosus*, in the list given at the end of our first volume.

waters of Europe, and is more generally dispersed than most others of the genus. Formerly it was confounded with *E. littoralis*, and is still, by many botanists, regarded as merely a state of that species. The branching and general habit of the two plants are very similar. *E. siliculosus* is, however, usually more slender, more gelatinous, softer, and more feathery in its ramification. A more absolute distinction lies in the difference of the *fruit*, which is here a lanceolate pod, while in *E. littoralis* one or more spores are immersed in the branches, where they sometimes form strings. Those who regard the two plants as states of one species, affirm that the pod-like fruit of the present is merely a *secondary* fruit, proving nothing. This view, after as careful consideration as I can give the subject, I am not disposed to adopt, at least, not until some more convincing arguments shall be brought forward, than its advocates have yet offered.

The specimen of which a magnified portion is represented at fig. 5, and on which our var. β is founded, was sent to me from Jersey by Miss White. In its general aspect and in ramification, it resembles the common *E. siliculosus*, but is remarkable for having its pods raised on very long peduncles, or, in other words, terminating the branches and ramuli. I am not aware that this variety has been previously noticed, nor have I seen a second specimen of it. Whether it be one of the one hundred and thirty new species of *Ectocarpus* which, I am informed, Prof. Meneghini has proposed, I am unable to say, not having received the Fifth Part of that author's work.

Fig. 1. ECTOCARPUS SILICULOSUS :—*of the natural size.* 2. A branch of var. α . 3. Utricles from the same. 4. A branch of var. β . 5. Utricle from the same :—*all more or less highly magnified.*



PLATE CLXXXIII.

ECTOCARPUS AMPHIBIUS, *Harv.*

GEN. CHAR. *Fronde* capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit* either spherical, elliptical, or lanceolate *utricles* (or *spores*) borne on the ramuli, or imbedded in their substance. ECTOCARPUS (*Lyngb.*),—from *εκτος*, *external*, and *καρπος*, *fruit*.

ECTOCARPUS *amphibius*; tufts short, loose, soft, pale olive; filaments very slender, subdichotomous; ultimate branches alternate, spreading; articulations two or three times longer than broad; utricles (?) linear-attenuate, spine-like, mostly sessile, scattered.

ECTOCARPUS *amphibius*, *Harv. Phyc.* vol. i. p. x.

HAB. In muddy ditches of brackish water, near the coast. Tide ditches, communicating with the Avon, below Bristol. *Mr. G. H. K. Thwaites*.

GEOGR. DISTR.

DESCR. *Filaments* 2–3 inches long, very slender, flaccid, forming small, indefinite tufts, growing on the mud, or attached to various substances, vaguely branched in a manner between dichotomous and alternate; the lesser divisions mostly alternate, erecto-patent, not much divided, nor remarkably attenuate. *Ramuli* scattered, thorn-like, at length frequently changed into exceedingly long, sessile, opaque, sporaceous bodies, evidently analogous to the utricle of *Ectocarpus siliculosus*, and of a character intermediate between these and the immersed fructification of *E. littoralis*. *Articulations* of the main branches twice or thrice as long as broad, pale olive, pellucid, mostly marked with a few irregular bands of more solid endochrome. *Colour* fading in the Herbarium, and becoming greener. In drying, it closely adheres to paper.

The occurrence of an *Ectocarpus* in brackish water, though not without precedent, deserves to be recorded, and it is more on that account, than because I am certain of the present plant being a good species, that I give it a place in this work. It will be seen that its characters border very closely on those of *E. siliculosus*, from which the usually sessile fructification and the attenuated form of this part chiefly distinguish it. The resemblance is so striking that one is almost disposed to the belief that our *E. amphibius* may be only *E. siliculosus* altered by growing in water which contains a very small quantity of salt. Mr. Thwaites, to whom I am indebted for a beautifully mounted specimen, and who also had the kindness to communicate fresh specimens,

gathered it in ditches near Bristol, into which the tide flows. It will probably be found to occur in similar situations elsewhere.

Fig. 1. ECTOCARPUS AMPHIBIUS; a tuft:—*of the natural size.* 2. A branch:—*magnified.* 3. Fertile ramuli:—*highly magnified.*



PLATE CCLVII.

ECTOCARPUS FENESTRATUS, *Berk.*

GEN. CHAR. *Fronde* capillary, jointed, olive or brown, flaccid, single-tubed, without longitudinal striæ. *Fruit* either spherical or elliptical, external or imbedded spores; or lanceolate, linear, or conical *silicules* (pod-like bodies); or granular masses formed in consecutive cells of the branches. ECTOCARPUS (*Lyngb.*),—from *εκτος*, *καρπος*, *external fruit*.

ECTOCARPUS *fenestratus*; pale green, very slender, forming small tufts; filaments not much branched; branches distant, alternate, furnished with a few long and simple, alternate ramuli; articulations of the branches twice or thrice as long as broad, pellucid; silicules stalked, scattered, at first clavate, then elliptic-oblong, obtuse, densely striate transversely, and cross-barred, dark brown.

ECTOCARPUS *fenestratus*, *Berk. in Herb. Griff. MSS. Harv. Man. Ed. 2. p. 58.*

HAB. Salcombe, *Mrs. Wyatt*. Annual. May.

DESCR. *Filaments* forming small tufts, very slender, one or two inches high, not very much branched; the branches lying apart and somewhat feathery, alternate, repeatedly divided, all the divisions erect, the ultimate ramuli prolonged and straight. *Articulations* variable (as in all the genus), usually in the middle part of the stems twice or thrice as long as broad, full of a pale olive, translucent endochrome, with a very few grains dispersed through it; in the upper part gradually shorter. *Silicules* pedicellate, at first club-shaped and narrow, afterwards becoming elliptic-oblong, or somewhat fusiform, but always very blunt at each end. When fully ripened they are dark coloured, marked with closely set, transverse and longitudinal striæ, which mark the surface with small, square reticulations, like a mosaic pavement, or the lattice of a window; an appearance alluded to in the specific name. *Colour*, pale greenish olive. *Substance* flaccid, closely adhering to paper.

The characters by which this plant is distinguished from others of the genus—namely, simplicity in branching and the peculiar form of the silicule,—appear sufficiently well marked; and we may therefore hope that we have here the foundation of a good species which will be detected in other localities, and in greater abundance than has yet been the case. At present I have only seen a single small specimen, or rather half a specimen, for the tuft that I owe to the kindness of Mrs. Griffiths

is cut in two :—and Mrs. Wyatt has only met with it once. This is, however, not to be wondered at, if we consider the extremely local nature of many species of *Ectocarpus*, and that Salcombe, the habitat of our novelty, is a considerable distance from the discoverer's ordinary abode. In appearance *E. fenestratus* is not unlike many specimens of *E. siliculosus*, but the form of the silicule is very different ; and in this character there is a much nearer approach to *E. tomentosus*, a species, which in all other respects, is widely different from *E. fenestratus*.

Fig. 1. ECTOCARPUS FENESTRATUS ; a tuft :—*the natural size*. 2. Portion of a filament :—*magnified*. 3. Small part of the same, with two ripe silicules. 4. Apex, with two young silicules :—*both highly magnified*.



PLATE CCLXXIII.

ECTOCARPUS FASCICULATUS, *Harv.*

GEN. CHAR. *Filaments* capillary, jointed, olivaceous or brown, flaccid, without longitudinal striæ. *Fruit* either spherical or elliptical, external or imbedded spores; or lanceolate, linear, or conical *silicules* (pod-like bodies); or granular masses formed in consecutive cells of the branches. ECTOCARPUS (*Lyngb.*),—from *εκτος, καρπος, external fruit*.

ECTOCARPUS *fasciculatus*; tufts olivaceous, dense; main filaments not much divided; the branches distant, set throughout with alternate or secund fascicles of subulate ramuli; the ramuli generally secund in each multifid fascicle; silicules sessile, secund, close together, ovate-acuminate or subulate.

ECTOCARPUS *fasciculatus*, *Harv. Man.* ed. 1. p. 40; ed. 2, p. 59. *Wyatt, Alg. Danm.* no. 302. *Kütz. Phyc. Un.* p. 288. *Sp. Alg.* p. 451. *J. Agardh, Sp. Alg.* p. 22.

HAB. Between tide-marks, on the larger Algæ; most commonly on *Laminaria digitata*.

GEOGR. DISTR. Atlantic shores of Europe and North America.

DESCR. *Filaments* densely tufted, from three to six or eight inches long, somewhat entangled together at the base into ropy bundles, free and feathery above, less branched than in most others of the genus, but nevertheless repeatedly divided. The ramification is irregular, between alternate and dichotomous, and the lesser branches especially are often flexuous or angularly bent. They are distantly branched, with patent axils, and furnished along their whole length with short, multifid ramuli, crowded together; not strictly *fasciculate*, it is true, but appearing so to the eye and to a moderately powerful lens. The ramuli are in truth secund, closely set, and often overlapping each other, a ramulus rising from each successive articulation of the penultimate branchlet. *Articulations* about twice as long as broad, containing a dense endochrome, with a wide border. *Silicules* very abundant, varying much in length, ovate-acuminate or subulate, very acute, densely striate transversely. *Colour* when young a deep, greenish olive, becoming pale and at length foxy in age. *Substance* membranaceous, soft, closely adhering to paper in drying when the plant is young—much less adhesive when old.

An exceedingly common species, easily recognized by the dense ramuli which appear to the naked eye to be tufted, but which are really only closely placed, and secund on the penultimate branchlets. The favourite habitat of *E. fasciculatus* is on

the expanded fronds of *Lam. digitata*, where it often fringes the segments in continuous tufts, but it is not confined to that plant, but is commonly found also on *L. bulbosa* and on *Himanthalia lorea*, and others of the larger fucoid Algæ. When young and well grown it is a very handsome species, but soon becomes coarse and ropy, and towards the close of the season is very much infested with *Diatomaceous* parasites.

I have received numerous specimens from correspondents in North America, in which country this would appear to be one of the most abundant of the genus.

The silicules are generally strictly sessile, but vary in form from linear-subulate to nearly ovate-acute.

Fig. 1. ECTOCARPUS FASCICULATUS:—*the natural size.* 2. Branch with fasciculate ramuli. 3. Branchlet with silicules:—*both magnified.*



PLATE XXII.

ECTOCARPUS HINCKSIÆ, *Harv.*

GEN. CHAR. *Filaments* capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit*, either spherical, elliptical, or lanceolate *utricles*, borne on the ramuli, or imbedded in their substance. ECTOCARPUS—from *ἐκτός*, external, and *καρπός*, fruit.

ECTOCARPUS *Hincksiæ*; tufted, dark olive; *filaments* irregularly and distantly branched; *branches* flexuous, furnished with secund ramuli pectinated on the upper side; utricles conical, sessile, lining the inner face of the ultimate ramuli.

ECTOCARPUS *Hincksiæ*; *Harv. Man.* p. 40.

HAB. Parasitical on *Laminaria bulbosa*. Annual. June. At Ballycastle, *Miss Hincks*. Torbay, *Mrs. Griffiths*; *Mrs. Wyatt*. Aberdeen, *Dr. Dickie*. Plymouth, *Rev. W. S. Hore*. Mounts Bay, Cornwall, abundant, *Mr. Ralfs*.

GEOGR. DISTR. British Islands.

DESCR. *Filaments* 1–2 inches high, dark olive, somewhat rigid for the genus, (the substance very similar to that of *E. littoralis*), irregularly and rather distantly branched, not matted together. The *branches* are furnished in the upper part with secund spreading or somewhat recurved ramuli, which bear on their inner faces a second series of closely set, subulate ones; the compound ramulus resembling a little comb. *Utricles* conical, sessile, produced along the inner face of the ramuli, one rising from almost every joint, giving to the ramulus the appearance, under a lens of low power, of being serrated.

My first knowledge of this species was from a solitary specimen gathered in 1840, by Miss Hincks, daughter of the venerable and respected Dr. Hincks, of Belfast. Though I had then seen but one specimen, yet so striking were its characters that I did not hesitate to describe it forthwith as a new species; and I had much pleasure in dedicating it to its discoverer, to whom I am indebted for many beautifully prepared and judiciously selected specimens of *Algæ*, and from whose explorations of our northern shores much more novelty may be expected.

Miss Hincks found her specimen on “one of the *Laminariæ*,” but neglected at the time to notice which. The uncertainty of habitat is, however, cleared up by Mr. Ralfs, who finds that in

June, at Mounts Bay, Cornwall, the stems of *L. bulbosa*, are almost exclusively infested with this rare plant. I did not find this to be the case last summer at Valentia, where *E. fasciculatus* was the prevailing parasite, nor has any other observer found *E. Hincksiae* in similar abundance. Nevertheless it is, perhaps, not uncommon, but without a careful inspection may be overlooked. A pocket lens is, however, amply sufficient to detect it, the comb-like, often scorpioid, ramuli affording an obvious character. When growing, as it sometimes does, mixed with *E. siliculosus*, the brighter and more glossy, and softer threads of the latter may be readily discriminated.

I shall look forward with interest to its occurrence on the Continent. It ought to inhabit most of the Atlantic shores of Europe, but I cannot find any description that agrees with it.

Fig. 1. ECTOCARPUS HINCKSIÆ:—*natural size*. 1. A portion of a filament. 3. A pectinate ramulus. 4. Joints of the main filament. 5. Fertile ramulus. 6. The same, after the discharge of the sporaceous matter:—*all more or less highly magnified*.

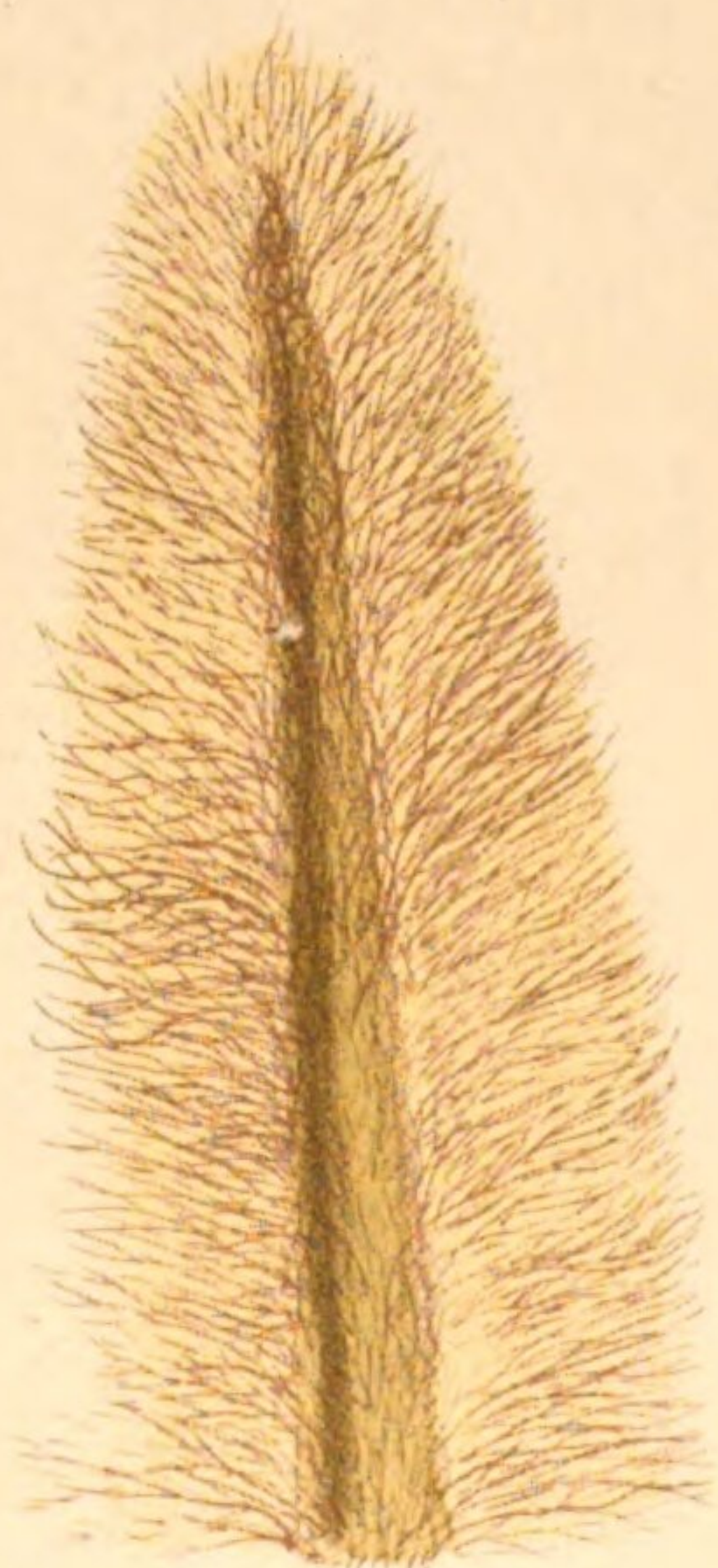


PLATE CLXXXII.

ECTOCARPUS TOMENTOSUS, *Lyngb.*

GEN. CHAR. *Frond* capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit* either spherical, elliptical, or lanceolate *utricles* (or *spores*) borne on the ramuli, or imbedded in their substance. ECTOCARPUS (*Lyngb.*),—from *εκτος*, *external*, and *καρπος*, *fruit*.

ECTOCARPUS *tomentosus*; filaments very slender, flexuous, irregularly branched, interwoven into a dense, sponge-like, branching frond; utricles stalked, linear-oblong, obtuse.

ECTOCARPUS *tomentosus*, *Lyngb. Hyd. Dan.* p. 132. t. 44. *Ag. Syst.* p. 163. *Ag. Sp. Alg.* vol. ii. p. 44. *Grev. Crypt. Fl.* t. 316. *Harv. in Hook. Br. Fl.* vol. ii. p. 326. *Harv. in Mack. Fl. Hib.* part 3. p. 181. *Wyatt, Alg. Danm.* no. 37. *Endl. 3rd Suppl.* p. 21. *Kütz. Phyc. Gen.* p. 290.

CERAMIIUM *tomentosum*, *Ag. Syn.* p. 64. *Hook. Fl. Scot.* part 2. p. 86.

CHANTRANSIA *tomentosa*, *Endl. 3rd Suppl.* p. 21.

CONFERVA *tomentosa*, *Huds. Fl. Ang.* p. 594. *Lightf. Fl. Scot.* p. 982. *With. Br. Pl.* vol. iv. p. 130. *Dillw. Brit. Conf.* t. 56. *Roth. Cat.* vol. ii. p. 180. and vol. iii. p. 147.

HAB. Parasitic on *Fucus vesiculosus*, *Himanthalia lorea*, and other Algæ, between tide-marks; occasionally on rocks and stones. Frequent on the British coasts. Annual. Summer.

GEOGR. DISTR. Atlantic shores of Europe and America. Cape Horn, *Dr. Hooker*.

DESCR. Spongy fronds (composed of innumerable densely matted filaments) from one to eight inches or more in length, sometimes half an inch in diameter below, usually much less, commonly from half a line to one or two lines, very much branched; branches alternate or irregular, filiform, crowded, simple, or bearing a second or third series of lesser branches; when spread out in the water beautifully feathered with the free portion of the filaments of which they are composed; collapsing, on removal from the water, into a spongy subgelatinous mass. *Filaments* very slender, equal, flexuous, very irregularly branched, the branches patent or divaricating, alternate or secund, often very short. *Articulations* twice or thrice as long as broad, more or less pellucid. *Utricles* linear-oblong, or somewhat elliptical, obtuse, borne on little stalks, rising from all parts of the lesser branches. *Colour* varying from a pale olive green to a rusty brown. *Substance* soft, and somewhat gelatinous; closely adhering to paper in drying.

From all the British species of *Ectocarpus* this is at once distinguished by a remarkable difference in habit, the filaments being aggregated together, intertwined, and even firmly compressed into a branching frond, which at first sight is not unlike the spongy frond of a *Codium*. In some specimens this character

is much more strongly developed than in others, the branches in them being singularly rope-like; while in an opposite variety the tips of the filaments and their lateral divisions are so nearly free that the plant assumes quite a feathery aspect.

On different parts of the coast this species differs much in size. It appears to flourish best in the north, especially in muddy, land-locked bays. Some specimens gathered by Dr. Greville in Staffa and Iona, and figured in that author's admirable Crypt. Flora, are exceedingly luxuriant; and I possess others from Carrickfergus of nearly equal beauty. The colour, too, is subject to much variation, but this is probably dependent on age, becoming more and more rusty as the season advances.

E. tomentosus was among the earliest of the genus noticed by botanists. It is described in the *Historia Muscorum* of Dillenius, and rudely figured at Tab. 3. f. 13. of that great work. Such at least is the opinion of Dillwyn: but Agardh refers the description and figure to his *E. compactus*, a plant which, to judge by the specimens which I have seen, is only an old and matted state of *E. littoralis*.

Fig. ECTOCARPUS TOMENTOSUS:—*of the natural size.* 2. A small part of the fibrous frond:—*magnified.* 3. Portion of a filament: *highly magnified.*



PLATE CCCXXX.

ECTOCARPUS CRINITUS, *Carm.*

GEN. CHAR. *Frond* capillary, jointed, olive or brown, flaccid, single-tubed, without longitudinal striæ. *Fruit*, either spherical or elliptical, external or imbedded *spores*; or lanceolate, linear, or conical *silicles* (pod-like bodies); or granular masses formed in consecutive cells of the branches. ECTOCARPUS (*Lyngb.*),—from *εκτος*, *καρπος*, *external fruit*.

ECTOCARPUS *crinitus*; filaments decumbent, forming extensive stratified tufts, sparingly branched; the branches subsimple, distant, elongated; ramuli few, patent; spores globose, scattered, sessile; articulations twice or thrice as long as broad.

ECTOCARPUS *crinitus*, *Carm. Alg. App. MSS. Harv. in Hook. Br. Fl.* vol. ii. p. 326. *Harv. Man.* ed. 1. p. 41. ed. 2. p. 60.

HAB. On muddy sea-shores. Annual. Summer. Rare. Appin, *Capt. Carmichael*. Watermouth, Devon, *Mrs. Griffiths*.

GEOGR. DISTR.

DESCR. *Filaments* from two to six inches long, forming widely spreading, fleecy tufts, which lie prostrate on the mud, at the recess of the tide, and frequently cover wide spaces. *Filaments* sparingly branched (for the genus), the branches long, distant, and subsimple, spreading at wide angles, mostly alternate, rarely opposite. *Ramuli* few, distant, scattered, divaricate or patent, short. *Articulations* twice or thrice as long as broad, containing a pale olive, rather watery endochrome. *Spores* (which I have only seen in a young state) globose, scattered, sessile. *Colour* a pale olive, becoming greener after the plant has been dried, in which state it adheres to paper. *Substance* soft and membranaceous.

I am but imperfectly acquainted with this species, which I have only seen in a dry state; and though I have repeatedly examined several parts of specimens collected by Capt. Carmichael, I have not been able to detect the fructification described by him; save in a single instance that I chanced upon the young spore represented at fig. 3. The nearest affinity of *E. crinitus* seems to be with *E. pusillus*, which has a nearly

similar ramification, but is a smaller plant, and almost always found with fruit.

Fig. 1. Tuft of *ECTOCARPUS CRINITUS*:—*the natural size*. 2. Parts of two filaments:—*magnified*. 3. Small portion with a ramulus and young spore:—*highly magnified*.



PLATE CLIII.

ECTOCARPUS PUSILLUS, *Griff.*

GEN. CHAR. *Frond* capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit* either spherical, elliptical, or lanceolate *utricles* (or *spores*), borne on the ramuli, or imbedded in their substance. ECTOCARPUS (*Lyngb.*),—from *εκτος*, *external*, and *καρπος*, *fruit*.

ECTOCARPUS *pusillus*; filaments tufted, interwoven, sparingly branched; branches distant, very patent, flexuous, bearing a few, irregular, patent, flexuous ramuli; spores roundish-oblong, subsessile, frequently opposite.

ECTOCARPUS *pusillus*, *Griff.* in *Wyatt. Alg. Danm.* no. 212. *Harv. Man.* p. 41. *E. Bot. Suppl.* t. 2872.

HAB. Parasitical on several of the smaller Algæ. Annual. Rare. Torquay, *Mrs. Griffiths*. Land's End, St. Michael's Mount, and Ilfracombe, *Mr. Ralfs*.

GEOGR. DISTR. South Coast of England.

DESCR. *Filaments* forming intricate, more or less interwoven tufts, from three to six inches in length, resembling "pale-brown wool;" slender, subsimple or sparingly branched, flexuous or somewhat zigzag, of equal diameter throughout, obtuse. *Branches* few, distant, very patent, very unequal in length, variously curved, obtuse, naked, or having a few very patent or horizontal, obtuse, unequal, scattered ramuli. *Spores* generally abundant, scattered over the filaments, roundish-oblong or sessile or subsessile, very elliptical, frequently opposite. In some cases the empty spore-case, after it has discharged the spore, alters its form, acquires joints, and seems to elongate into a ramulus. *Articulations* of the principal branches rather longer than broad, filled with granular fluid, contracted at the joints. *Substance* membranous, void of gloss, adhering, but not very closely, to paper in drying. *Colour*, when young, greenish olive, becoming gradually a pale brown.

One of the least beautiful forms of the genus, but not without interest, as a connecting link between the simpler and more branching species. It was first found by *Mrs. Griffiths* in the year 1835, and first made known to botanists in the excellent, and often quoted, '*Algæ Danmonienses*' of *Mrs. Wyatt*. It grows on several of the smaller Algæ, which it clothes with shaggy flocculi, compared by *Mrs. Griffiths* to tufts of "pale-brown wool." In drying it sometimes assumes a green colour.

The nearest species, among British plants at least, to which it

approaches, is the *E. crinitus* of Carmichael, a little-known plant, having a very similar mode of branching and general habit; but differing in its greener colour, larger size, and more especially in the form of its fruit, and in the locality in which it is found.

Ectocarpus pusillus has not, that I am aware, been noticed anywhere save on the south coast of England, but it is one of those *unobtrusive* plants, if I may so call them, which, unless closely looked for, are easily over-looked; and as it has few beauties to recommend it to the mere gatherer of "pretty things," it may often be neglected as not worth notice, or as being some other plant in an imperfect state. It is no easy matter, at all times, to recognize the different *Ectocarpi* by the naked eye, and this accounts for so many species of this genus being passed over by persons who are unaccustomed to the microscope.

Fig. 1. *ECTOCARPUS PUSILLUS*; growing on *Corallina officinalis*:—of the natural size. 2. Portion of a filament, in fruit:—magnified. 2. Portion of the same:—more highly magnified.

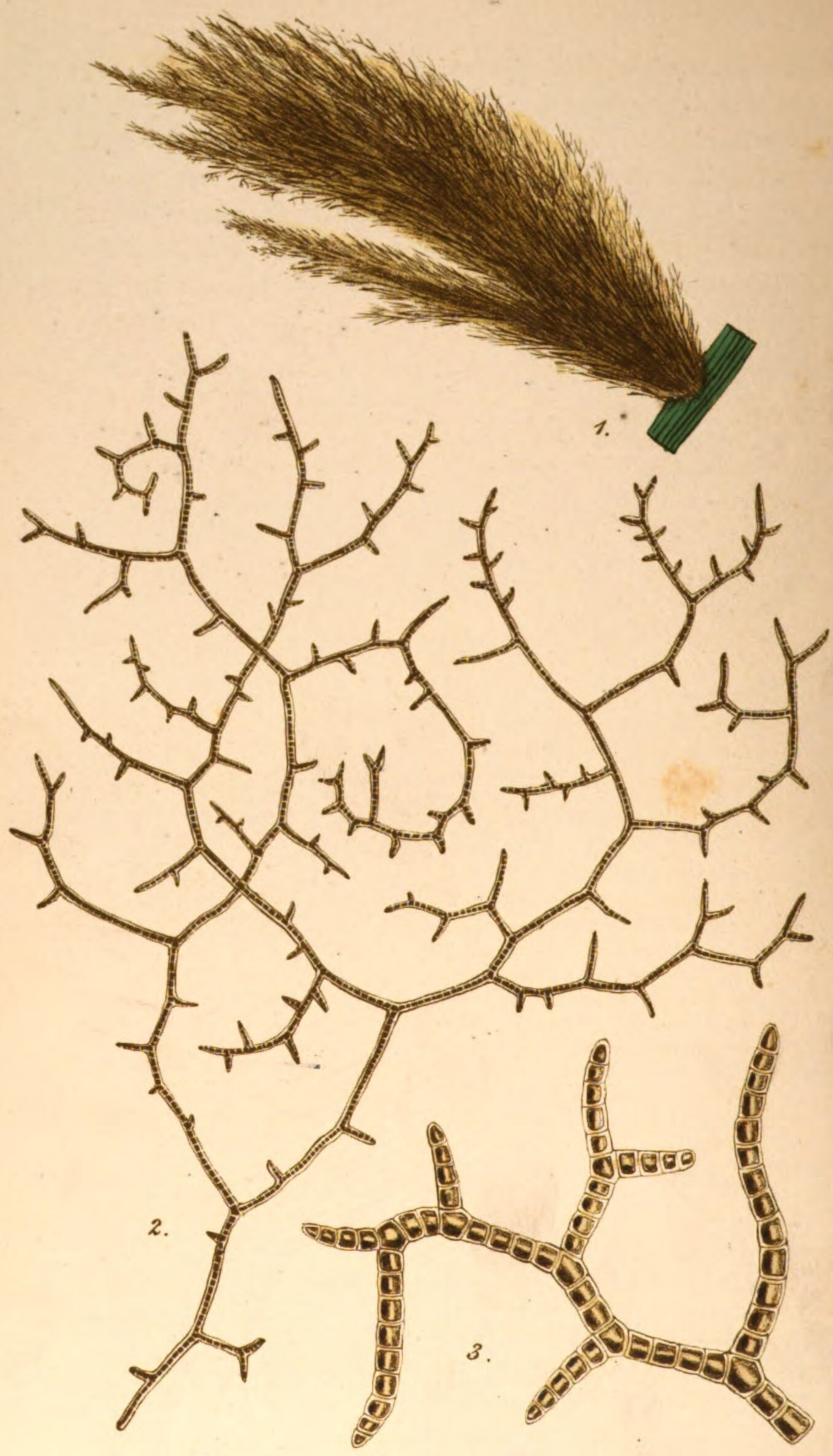


PLATE CCCXXIX.

ECTOCARPUS DISTORTUS, *Carm.*

GEN. CHAR. *Fronde*s capillary, jointed, olive or brown, flaccid, single-tubed, without longitudinal striæ. *Fruit*, either spherical or elliptical, external or imbedded *spores*; or lanceolate, linear, or conical *silicles* (pod-like bodies); or granular masses formed in consecutive cells of the branches. ECTOCARPUS (*Lyngb.*),—from *εκτος*, *καρπος*, *external fruit*.

ECTOCARPUS *distortus*; filaments very much branched, matted together, dark-brown, angularly bent; branches spreading at very obtuse angles, alternate or secund; ramuli horizontally patent or recurved, scattered, short, spine-like, obtuse; spores obovate, sessile or subsessile.

ECTOCARPUS *distortus*, *Carm. Alg. Appin. MSS. cum Ic. Harv. in Hook. Br. Fl.* vol. ii. p. 326. *Harv. Man.* ed. 1. p. 42. ed. 2. p. 60.

HAB. Parasitical on the leaves of *Zostera marina*. Annual. Summer and autumn. Appin, *Capt. Carmichael* (1824), *Rev. D. Landsborough* (1850).

GEOGR. DISTR.

DESCR. *Tufts* from four to eight inches long or more, very dense and full; the threads of which they are composed closely matted together and inextricable. *Filaments* very much branched, and in a very irregular manner between alternate and dichotomous; the branches spreading at very wide angles, forming almost rounded axils, and bent at intervals in a zigzag manner. Lesser branches either spreading at right angles or recurved. *Ramuli* scattered freely along the branches, divaricating, short, spine-like, but obtuse. *Articulations* pretty uniformly as long as broad, enclosing a square mass of dark-coloured endochrome, the walls of the cells thick, leaving wide colourless dissepiments. *Spores* (which I formerly examined on one of *Capt. Carmichael's* specimens, but which I have not succeeded in finding on the one now figured) obovate or elliptical, scattered, sessile or slightly stalked, dark brown, with a pellucid limbus. *Colour* a deep chestnut-brown. *Substance* membranaceous, and very brittle, if moistened after having been dried. The plant imperfectly adheres to paper.

In a former number, under *E. Landsburgii* (Plate CCXXXIII.) I have pointed out the marks of distinction between that species and the present, its nearest ally. A comparison of the two figures will now enable the student to appreciate the characters

of these plants, and, I hope, to discriminate between them. *E. Landsburgii* is not only more thorny in aspect, but is of a far more rigid substance, and much less transparent: nor does it grow in large densely interwoven tufts like *E. distortus*. Both species appear to be of rare occurrence.

The figure now given has been prepared partly from an original drawing by Carmichael, and partly from one of his specimens.

Fig. 1. Tuft of *ECTOCARPUS DISTORTUS*:—*the natural size*. 2. Portion of a filament, to show the branching:—*magnified*. 3. Small fragment of the same:—*highly magnified*.

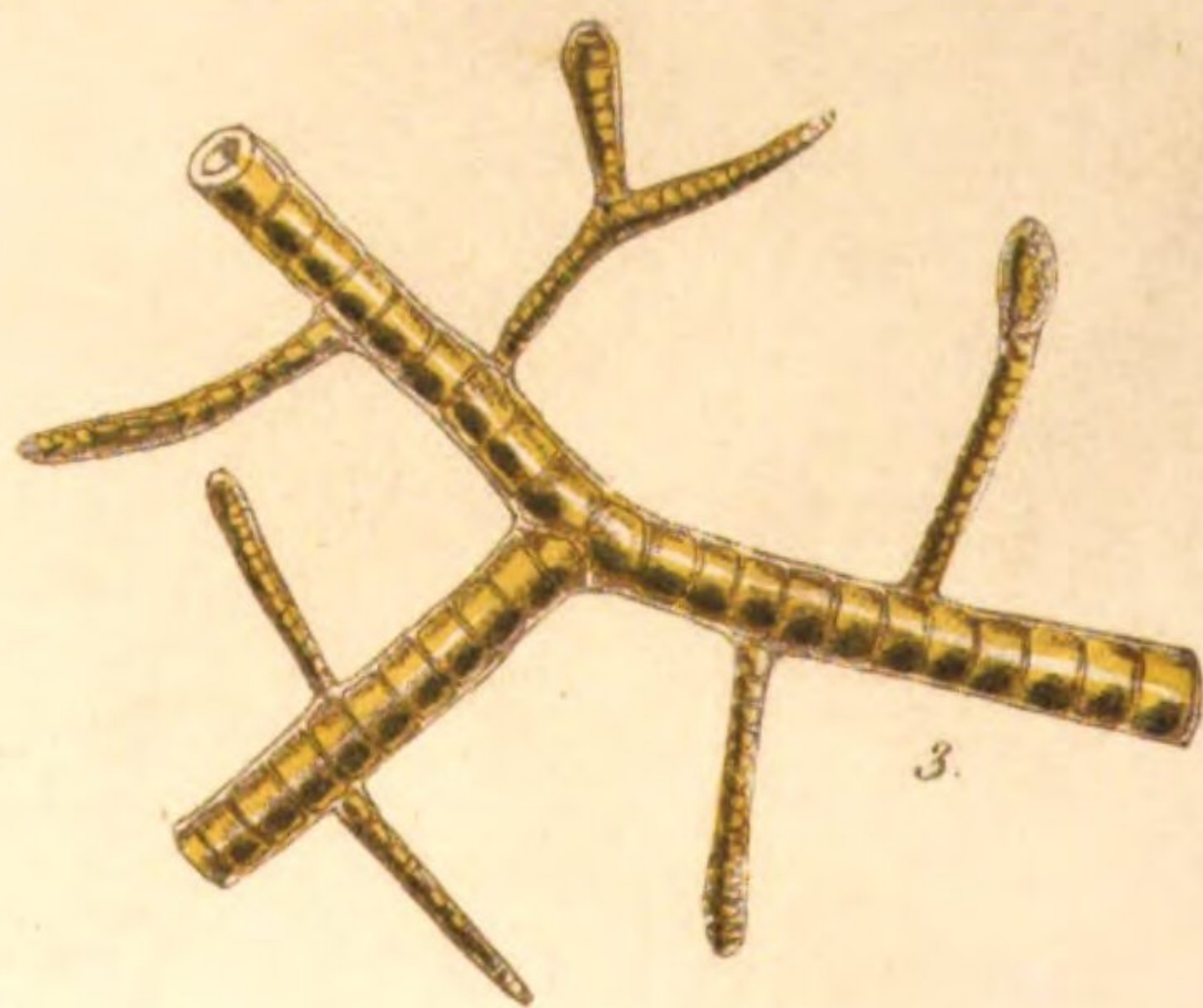


PLATE CCXXXIII.

ECTOCARPUS LANDSBURGII, *Harv. (n. sp.)*

GEN. CHAR. *Fronde* capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit* either spherical, elliptical, or lanceolate *utricles* (or *spores*) borne on the ramuli, or imbedded in their substance. ECTOCARPUS (*Lyngb.*), —from *εκτος*, *external*, and *καρπος*, *fruit*.

ECTOCARPUS *Landsburgii*; filaments dark-brown, tenacious, intricate, much branched; branches irregularly forked, divaricated, zigzag, bristling with numerous short, spine-like, horizontal ramuli; articulations shorter than broad, the endochrome filling the cell, and recovering its shape on being moistened, after having been dried.

HAB. Dredged in deep water, in land-locked bays; rare. Annual. Summer. Lamlash, Isle of Arran, *Rev. D. Landsborough*. Roundstone Bay, Galway, *W. H. H.*

GEOGR. DISTR. Shores of Scotland and Ireland.

DESCR. *Filaments* capillary, one or two inches in length, densely entangled in small tufts, or rolled together in masses, irregularly much branched, of about the same diameter from the base to the apex. *Branches* spreading at very wide angles, dichotomous, or alternate, the lesser divisions very patent, horizontal, or recurved. *Ramuli* short, spine-like, horizontal, simple, or forked, not half a line in length, now thinly, now thickly scattered over the branches, rarely opposite. *Articulations* shorter than broad, filled by a coloured bag; the dissepiments and border very narrow. *Substance* tenacious, membranous, not closely adhering to paper, and not affected by long steeping in fresh water. *Colour*, a dark brown.

The first specimens which I received of this curious little plant were dredged by my friend the Rev. D. Landsborough in Lamlash Harbour, a circumstance which I record in the specific name; pleased with the opportunity thus afforded me of connecting Mr. Landsborough's name with the botany of an island whose history and natural beauties it has been to him a labour of love to illustrate by his pen.*

The ramification of our *E. Landsburgii* so nearly agrees with that of *E. distortus*, *Carm.*, that I felt disposed, at first, to regard it as that species. But a careful comparison of both

* ARRAN, a poem in six cantos; and Excursions to Arran, with reference to the natural history of the island. By the Rev. D. Landsborough:—Edinburgh, 1847.

plants, placed side by side on the table of the microscope, has convinced me of their perfect distinctness. In *E. distortus* the endochrome is small, leaving wide dissepiments and colourless borders; the substance is exceedingly tender, and the branches break up into innumerable frustules when re-moistened. In fact, it is impossible to trace the ramification from the extreme *rotteness* of the moistened frond. In *E. Landsburgii* on the contrary, the endochrome completely fills the cavity; the dissepiments are mere lines; and the substance is exceedingly tough, and may be kept in fresh water for hours or days, without injury. These characters appear to me sufficient. We must also bear in mind that *E. distortus* is a littoral species, while our new species has only been found by dredging in deep water. It appears to be of rare occurrence. Mr. Landsborough found only a few small tufts; nor was I much more fortunate in collecting it at Roundstone. It is satisfactory to know, however, as establishing the character of the species, that the specimens from the west of Ireland agree in all respects with those from Scotland.

Fig. 1. ECTOCARPUS LANDSBURGII:—*of the natural size.* 2. A branching portion. 3. Part of the same. 4. Transverse section of the stem:—*all more or less highly magnified.*



PLATE CXCVII.

ECTOCARPUS LITORALIS, *Lyngb.*

GEN. CHAR. *Frond* capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit* either spherical, elliptical, or lanceolate *utricles* (or *spores*) borne on the ramuli, or imbedded in their substance. ECTOCARPUS (*Lyngb.*),—from *εκτος*, *external*, and *καρπος*, *fruit*.

ECTOCARPUS *litoralis*; tufts dense, interwoven, olive-brown or foxy; filaments coarse, much and irregularly branched, the ultimate branchlets patent, alternate, or rarely opposite; masses of fructification imbedded in the substance of the branches, in the form of oblong swellings.

ECTOCARPUS *litoralis*, *Lyngb. Hyd. Dan.* p. 130. t. 42. (excl. var. β .) *Ag. Sp. Alg.* vol. ii. p. 40. *Harv. in Hook. Br. Fl.* vol. ii. p. 325. *Harv. in Mack. Fl. Hib.* part 3. p. 181. *Harv. Man.* p. 40. *Wyatt, Alg. Danm.* no. 129. *Kütz. Phyc. Gen.* p. 289. *Endl. 3rd Suppl.* p. 21.

ECTOCARPUS *compactus*, *Ag. Sp. Alg.* vol. ii. p. 41.

ECTOCARPUS *ferrugineus*, *Ag. Syst.* p. 163. *Ag. Sp. Alg.* vol. ii. p. 43. *Kütz. Phyc. Gen.* p. 289 (?)

CONFERVA *litoralis*, *Linn. Sp. Pl.* p. 1634. *Huds. Fl. Ang.* p. 594. *Lightf. Fl. Scot.* p. 979. *With. Br. Ar.* vol. iv. p. 130. *Roth, Cat. Bot.* vol. i. p. 152. *Dillw. Conf.* t. 31. *E. Bot.* t. 2290.

HAB. Parasitical on *Fuci* and *Laminariæ*, within and beyond the influence of the tide. Annual? At all seasons. Very common on the British shores.

GEOGR. DISTR. Abundant throughout the Northern and Atlantic Oceans.

DESCR. *Filaments* from six to twelve inches long, densely tufted, coarse, excessively branched, and often bundled together and matted into inextricable fascicles. *Branches* spreading, very irregularly inserted, usually alternate or scattered, sometimes, especially the smaller ones, opposite, repeatedly divided, of unequal length and composition. *Ramuli* scattered, or somewhat fascicled, usually alternate, erecto-patent, filiform, slightly tapering. *Articulations* about as long as broad, or a little longer. Masses of *fructification* formed at intervals in the substance of the smaller branches and ramuli, oblong, more or less elongated, consisting of swellings, twice the diameter of the filament, dark-coloured, and transversely striate. *Colour* when young, a greenish olive, becoming more and more brown, and even foxy, or reddish in old age. *Substance* soft, but not gelatinous, closely adhering to paper in drying, and not recovering well on re-immersion.

One of the commonest of the British Algæ, and widely dispersed along the shores of the ocean of most temperate countries, its specific name *litoralis* is peculiarly applicable. Nor is this shore plant at all particular in choosing the substances to which it

adheres, or the depth of water where it vegetates. It equally infests the *Fuci*, which grow between tide-marks, covering with a shaggy brown fleece those that occur near high-water mark, and those that prefer a deeper level; and the *Laminariæ* that are never exposed to the air. It thus extends nearly throughout the whole belt occupied by sea plants. Nor is it confined to open sea shores; it frequents estuaries, and ascends tidal rivers for a considerable distance, growing either on *Fucus vesiculosus* or on submerged wood-work, and even on mud. Towards the close of the summer the tufts become detached, and float about in large masses, and at length are stranded in broad belts along the coast. On these, decaying under the atmosphere, Captain Carmichael first detected the curious *Sphærozyga Carmichaelii* already figured in our first volume. (Pl. CXIII.)

I have no hesitation in uniting the *E. compactus* and *E. ferrugineus* of Continental authors, with our *E. litoralis*. The characters attributed to those forms depend on age, and are gradually assumed as the plant passes its maturity and tends to decay. In the first stage of its decline it frequently becomes much matted into ropy strings, and thus becomes *E. compactus*; and eventually assumes a rusty colour, and becomes *E. ferrugineus*.

Fig. 1. Tuft of *ECTOCARPUS LITORALIS* growing on a fragment of *Fucus serratus*:—of the natural size. 2. Part of a fertile branch. 3. Ramuli from the same:—both magnified in different degrees.



PLATE CCLVIII.

ECTOCARPUS LONGIFRUCTUS, *Harv.*

GEN. CHAR. *Filaments* capillary, jointed, olivaceous or brown, flaccid, without longitudinal striæ. *Fruit* either spherical or elliptical, external or imbedded spores; or lanceolate, linear, or conical *silicules* (pod-like bodies); or granular masses formed in consecutive cells of the branches. ECTOCARPUS (*Lyngb.*),—from *εκτος*, *καρπος*, *external fruit*.

ECTOCARPUS *longifructus*; tufts large, branching, the divisions feathery; filaments robust, excessively branched, branches mostly opposite, the lesser ones set with short, spine-like, opposite or rarely alternate ramuli; articulations as long as broad; silicules very long, linear-lanceolate, attenuate, densely striate transversely, terminating the principal branches and ramuli.

ECTOCARPUS *longifructus*, *Harv. Man. Ed. 2. p. 61.*

HAB. Parasitical on Algæ between tide-marks. Skail, Orkney, *Mrs. Moffatt*.

DESCR. *Tufts* six or eight inches long, much branched and feathery. *Filaments* robust, not much entangled, excessively divided, the branches and ramuli very generally opposite, sometimes alternate, spreading at wide angles. The smaller branches are furnished with numerous, opposite or alternate, short, spine-like ramuli, and mostly end in the very long silicules which are so striking a feature in this plant. These silicules are very much longer than the branchlet that bears them, and taper from the base to the apex, which is very acute or acuminate: they are closely netted with longitudinal and transverse lines. *Articulations* of the stem and branches about as long as broad, or a little longer. *Colour*, a greenish olive. It closely adheres to paper in drying.

I here figure an *Ectocarpus* from Orkney nearly related to *E. litoralis*, rather than to *E. siliculosus*, and differing chiefly in the greater luxuriance of the frond, and the different form of the fructification. The fructification of our present plant, however, must be regarded more as an exaggeration of that of *E. litoralis* than as essentially different. In *E. litoralis* the apices of the branches grow out beyond the portion converted into fructification, and the latter therefore appears as if it were immersed in

the branch; here when the ramuli are fertile the whole of the upper portion of the ramulus becomes the fruit. Such a character, if constant, would very well serve for a specific diagnosis, but its constancy has yet to be tested. Our *E. longifructus* rests at present upon a solitary specimen preserved in the herbarium of the Rev. J. H. Pollexfen, of Clapham, to whom I am indebted for my knowledge of this plant, and who has allowed me to abstract one of the lateral branches of his specimen. Persons visiting Orkney would do well to look carefully after the *Ectocarpi*, among which many more forms may yet be noticed. The characters of these plants cannot always be detected by the naked eye, nor are they easily recognisable except when in fructification. I am fully sensible that it is unsafe to propose new species from an inspection of individual specimens, but there are cases in which this course may safely be taken; and it will be remembered that *Ectocarpus Hincksiae* is an instance of a species founded, like the present, on a solitary specimen picked up by a lady, but which, in a short time, was ascertained to exist on many distant shores, and which is now well established. I hope the present experiment may be equally successful.

Fig. 1. *ECTOCARPUS LONGIFRUCTUS*:—*the natural size*. 2. A branch:—*magnified*. 3. Silicules from the same:—*highly magnified*.



PLATE CC.

ECTOCARPUS GRANULOSUS, *Ag.*

GEN. CHAR. *Fronde* capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit* either spherical, elliptical, or lanceolate *utricles* (or *spores*) borne on the ramuli, or imbedded in their substance. ECTOCARPUS (*Lyngb.*),—from *εκτος*, *external*, and *καρπος*, *fruit*.

ECTOCARPUS *granulosus*; filaments olive, the principal divisions slightly entangled; branches free, feathery; the lesser branches and ramuli opposite, spreading; utricles elliptical, dark coloured, sessile on the ramuli.

ECTOCARPUS *granulosus*, *Ag. Syst.* p. 163. *Ag. Sp. Alg.* vol. ii. p. 45. *Harv. in Hook. Fl. Brit.* vol. ii. p. 326. *Harv. in Mack. Fl. Hib.* part 3. p. 182. *Endl. 3rd Suppl.* p. 21. *Harv. Man.* p. 42. *Wyatt, Alg. Danm.* no. 38.

CONFERVA *granulosa*, *E. Bot.* t. 2351.

HAB. On rocks; also on Corallines and various other Algæ, in rock-pools between tide marks. Annual. May and June. Not uncommon on the English and Irish coasts.

GEOGR. DISTR. Heligoland. Coast of France.

DESCR. *Root*, a small disc. *Filaments* more or less densely tufted, capillary, from four to eight or ten inches long, much branched, with more or less of a principal, undivided stem, furnished with lateral branches of unequal length, so that the habit is often virgate. The chief divisions somewhat matted together, but all the lesser ones free and distinct, standing out on all sides, in a feathery manner. Lesser branches and ramuli very generally opposite, sometimes alternate, spreading at wide angles, unequal, long and short intermixed together without order, somewhat attenuated. *Apices* rather acute. *Articulations* about as long as broad, faintly striate longitudinally. *Utricles* abundantly scattered on the ramuli, elliptical, dark-coloured, with a narrow limbus, sessile on the upper faces of the ramuli. *Colour*, when quite fresh, a clear olive, becoming green in fresh water, and often yellowish as the plant increases in age. *Substance* soft, but not gelatinous, adhering to paper in drying.

A well-marked and large growing species, originally discovered by Mr. Borrer, and first described and figured in English Botany. It is by no means uncommon on various parts of the coasts, usually growing on the smaller Algæ in tide-pools, though occasionally flourishing on the fronds of *Laminariæ*. The opposite branches and ramuli, bearing dark-coloured elliptical utricles on their upper side, readily distinguish this plant from any of its British congeners. The species, which most nearly

approach it, are *E. sphærophorus* and *E. brachiatus*, but both these differ in fructification. In some varieties the ramuli are not regularly opposite. It is frequently a difficult matter to trace the affinity of such wayward forms; and possibly one or two species, now confounded with *E. granulosus*, may eventually be separated.

Fig. 1. Tuft of *ECTOCARPUS GRANULOSUS* :—*of the natural size.* 2. Portion of a fertile branch. 3. Ramuli and utricles from the same :—*both magnified in different degrees.*



PLATE CXXVI.

ECTOCARPUS SPHÆROPHORUS, *Carm.*

GEN. CHAR. *Fron*d capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit* either spherical, elliptical, or lanceolate *utricles* (or *spores*), borne on the ramuli, or imbedded in their substance. ECTOCARPUS (*Lyngb.*),—from *εκτος*, *external*, and *καρπος*, *fruit*.

ECTOCARPUS *sphærophorus*; filaments slender, short, densely tufted, much branched; upper branches patent, opposite or in fours, bearing patent, opposite ramuli; spores globose, sessile, either opposite to each other, or to a branchlet.

ECTOCARPUS *sphærophorus*, *Carm. Alg. Appin. ined. Harv. in Hook. Br. Fl.* vol. ii. p. 326. *Harv. in Mack. Fl. Hib.* part 3. p. 182. *Harv. Man.* p. 42. *Wyatt, Alg. Danm.* no. 173.

ECTOCARPUS *brachiatus*? *Ag. Sp. Alg.* vol. ii. p. 42.

HAB. Parasitical on the smaller Algæ, between tide-marks. Annual. Summer. Rare. Appin, on *Cladophora rupestris*, *Capt. Carmichael*. Sidmouth and Torquay, on *Ptilota sericea*, *Mrs. Griffiths*. Bantry Bay, *Miss Hutchins*. Land's End, Mount's Bay, Ilfracombe, and Milford Haven, all on *Ptilota sericea*; Menai Bridge, on *Cladophora rupestris*, *Mr. Ralfs*. In a narrow, darkened chasm, on east side of Eda, Orkney, parasitical on *Ptilota sericea*, and *Clad. rupestris*, *Lieut. F. W. L. Thomas* and *Dr. Mc Bain*.

GEOGR. DISTR. British Islands. Baltic Sea?

DESCR. *Filaments* densely tufted, capillary, one to three inches high, straightish, the tufts somewhat spiry; main threads somewhat matted together, the branches free, many times divided. Lesser branches short, opposite, or in fours, very patent, furnished at distant intervals with pairs of short opposite spine-like ramuli. Apices attenuated but not very acute. *Spores* spherical, dark olive, with a pellucid border, sessile, borne on the sides of the branches, and opposite to each other or to a ramulus; each spore, in fact, occupying the normal position of a ramulus, and substituted for one on fertile specimens. *Articulations* about as long as broad, semi-transparent, with a few large grains. *Colour* olivaceous, or rusty, or yellowish-brown. *Substance* flaccid, closely adhering to paper, wholly without gloss when dry.

This species was first observed by the late Capt. Carmichael, on the western shores of Scotland, about the year 1824; since which period it has been detected in many other localities between Orkney and Cornwall, but is nowhere a common plant, and where it does occur, it is "not diffused", as Mr. Ralfs well observes,

“ throughout the bay, but is confined to the space of a few rocks, on which it forms, as it were, a colony, or is gregarious.” It appears by no means indifferent to what plant it attaches its fronds, being very generally found growing on *Ptilota sericea*, though frequently also on *Cladophora rupestris*. I am not aware that it ever infests any other Algæ.

The nearest affinity is with *E. brachiatus* (Pl. IV.), from which it is most readily known by the difference in the fruit, the spores being in that species lodged in swellings or enlargements of the smaller branches in the axils of the opposite ramuli; and in this being formed by a metamorphosis of the ramuli themselves. My friend, Professor Kützinger, strongly urges that this difference indicates, not a different species, but a different condition of the same species: in like manner as the two modes of fructification found in the *Florideæ* are not to be regarded as specific characters. There is something, certainly, still to be cleared up respecting the fructification of the *Ectocarpi*, to reconcile the varying appearances which the organs of reproduction assume in different species. Nevertheless I am disposed to retain the present species distinct from *E. brachiatus*, at least, until their identity be proved; because, independently of fructification, there is a difference in aspect, more readily seen than described in words, and because they are found as parasites upon different Algæ. Both species have been collected and observed by very accurate botanists, who do not find them intermixed, and are firmly persuaded that they are essentially different.

Dr. J. D. Hooker brought from Cape Horn an *Ectocarpus* (*E. geminatus*, Hook. fil. et Harv.) closely resembling our *E. sphærophorus*, and also forming spores by an alteration of the ramuli; but its spores are of a conical, not spherical, form. It would be very interesting should future observations detect this analogous species on the shores of the Shetland Islands.

Fig. 1. ECTOCARPUS SPHÆROPHORUS; a tuft:—of the natural size, growing on a fragment of *Ptilota sericea*. 2. Portion of a branch. 3. Ramuli, with spores:—both magnified.

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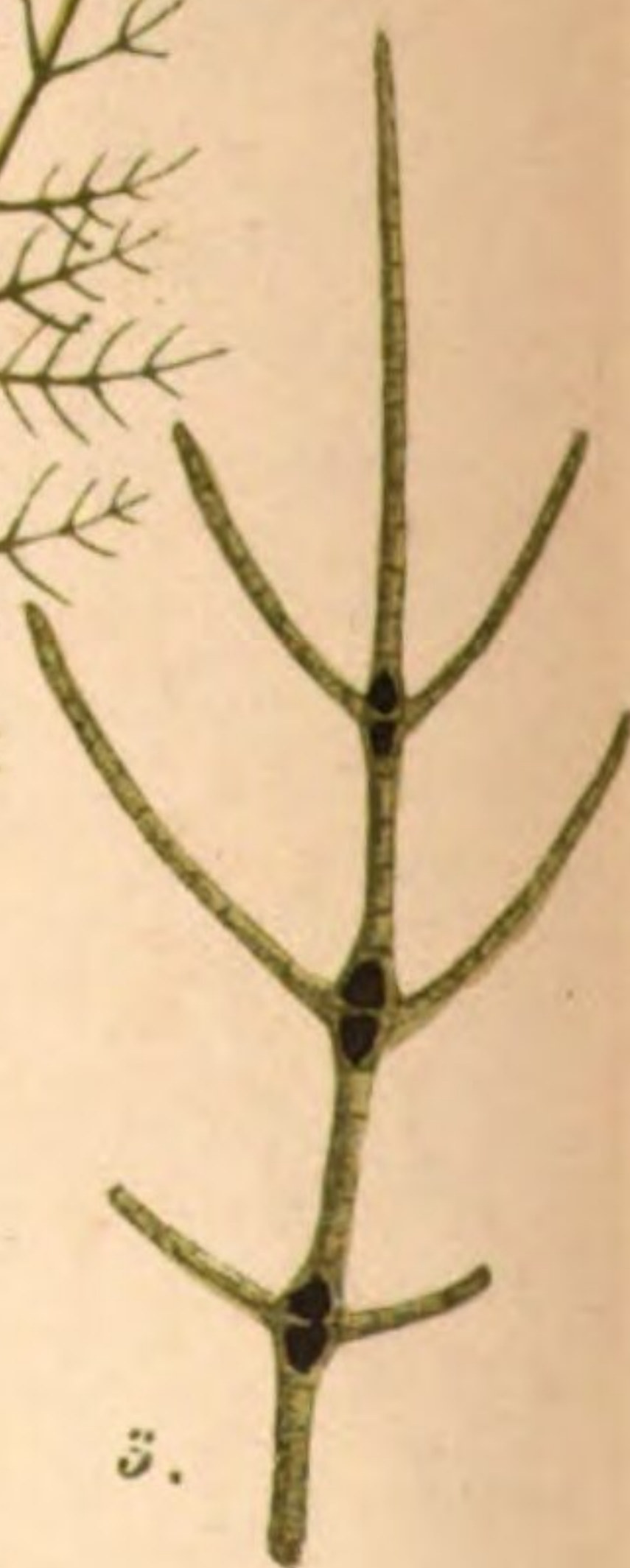
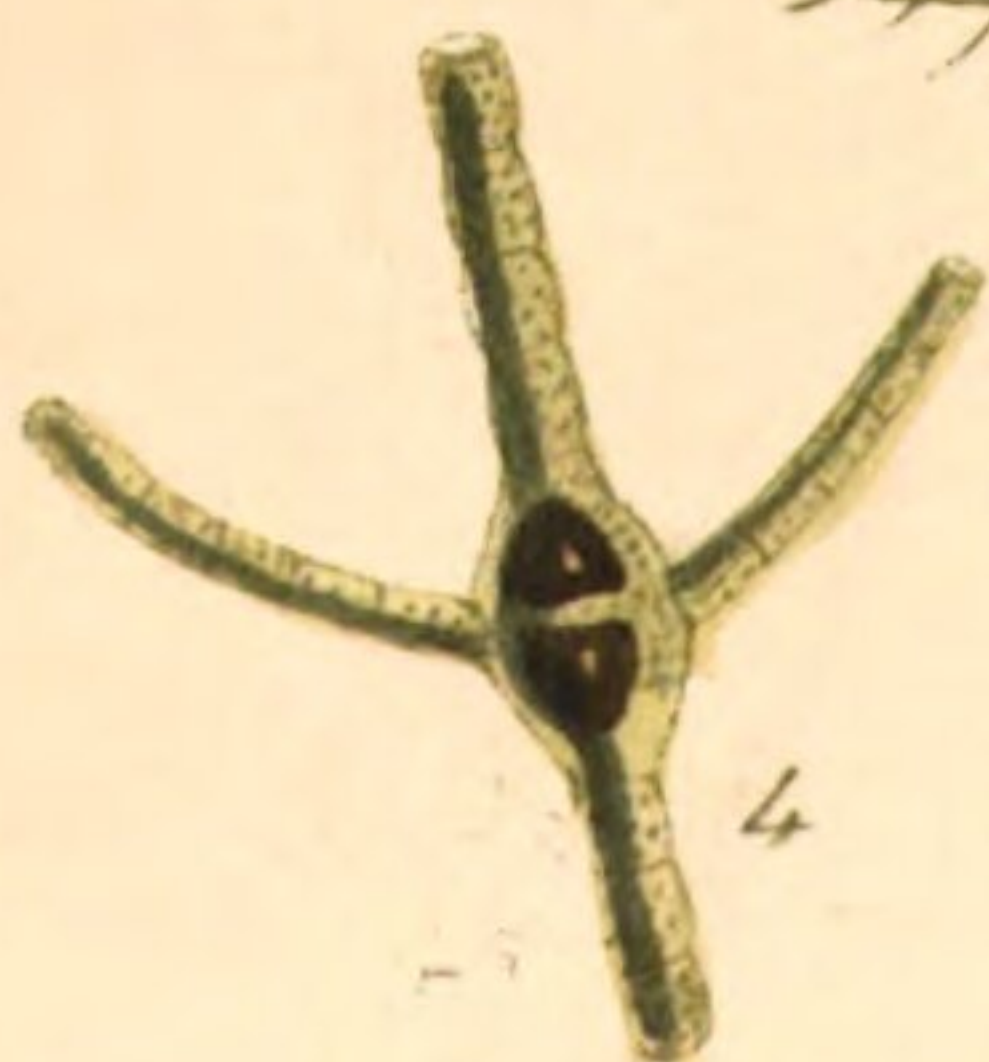
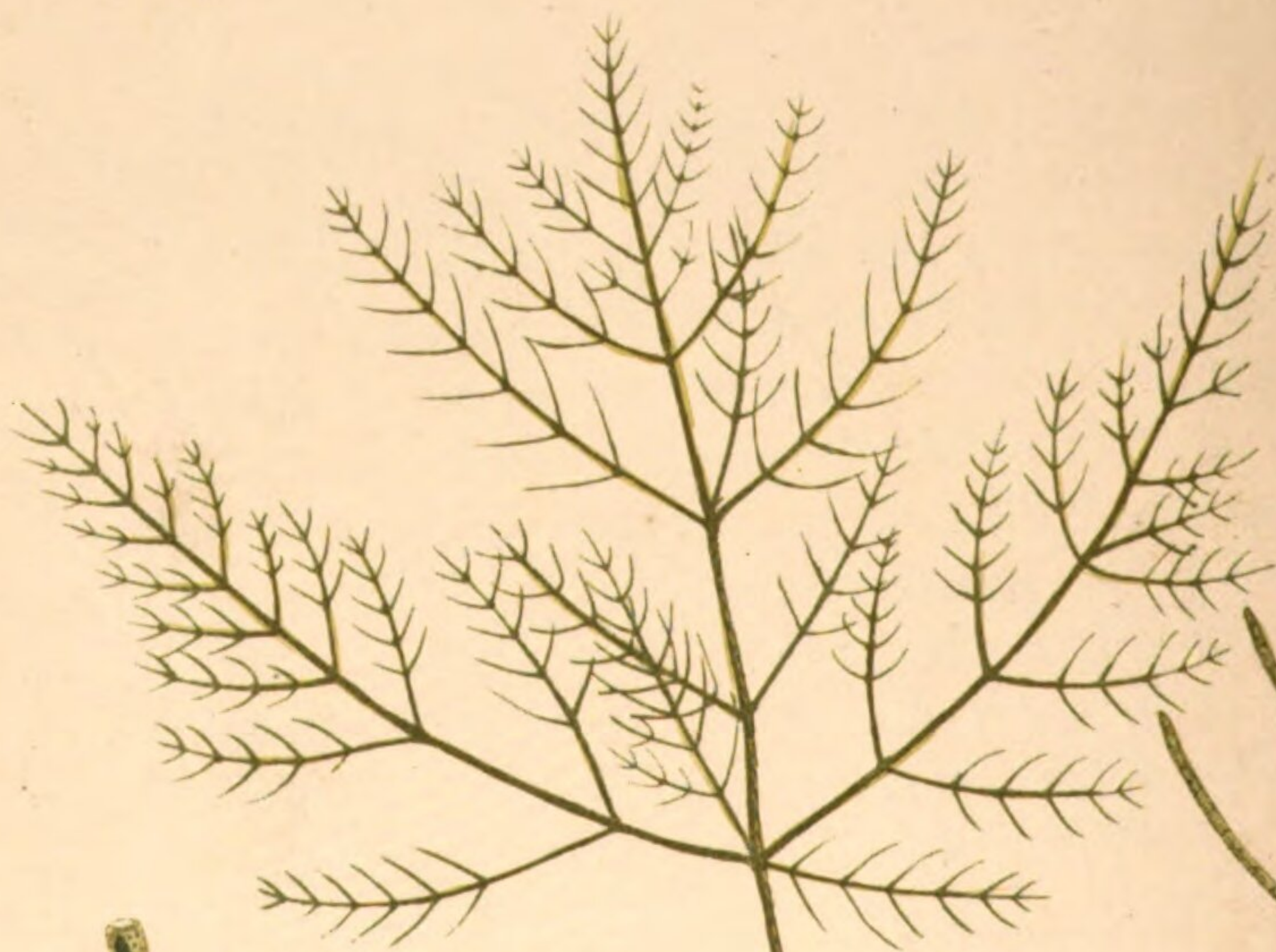
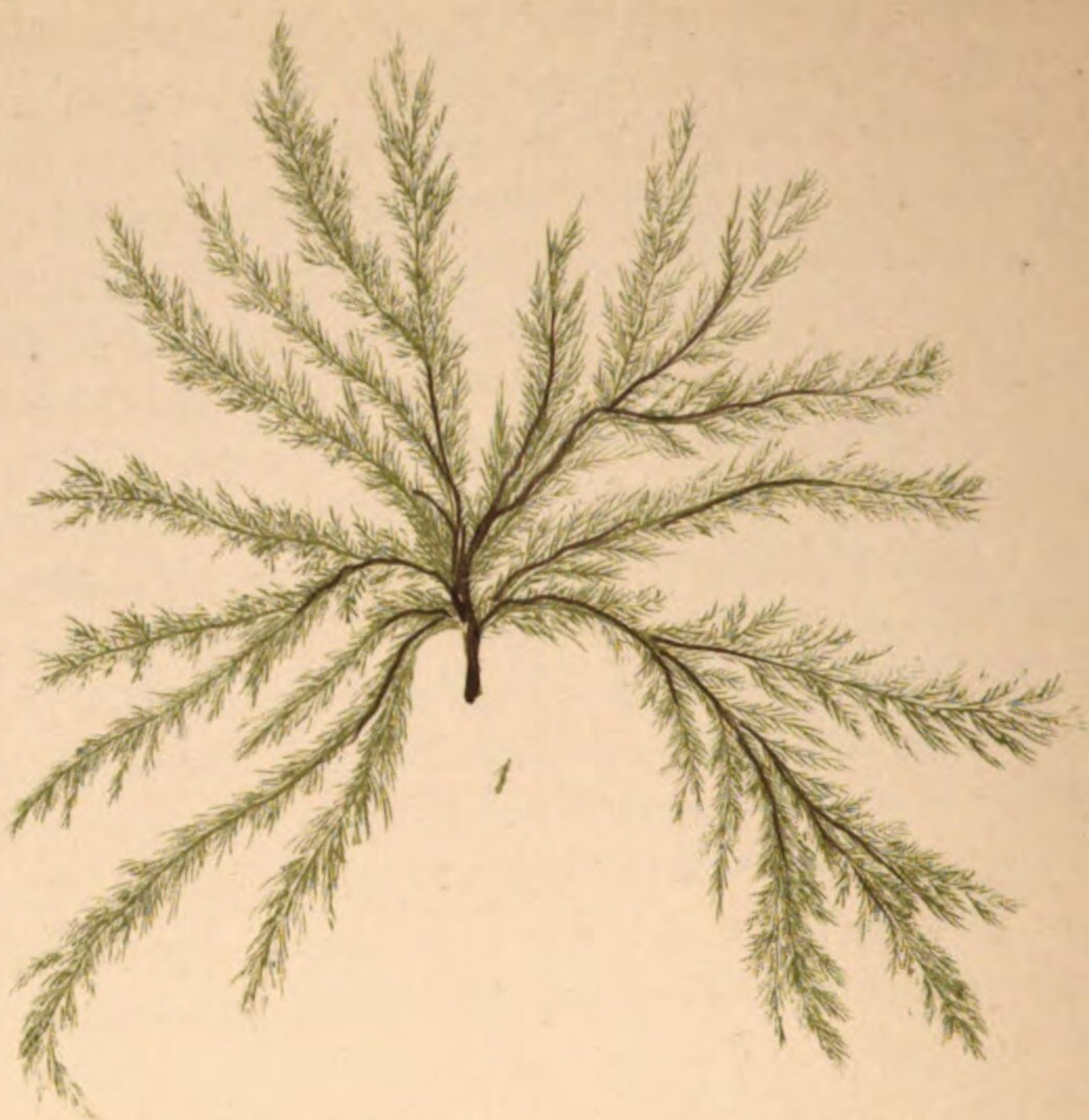


PLATE IV.

ECTOCARPUS BRACHIATUS, *Harv.*

GEN. CHAR. *Filaments* capillary, jointed, olive or brown, flaccid, single tubed. *Fruit*; either spherical, elliptical, or lanceolate capsules borne on the ramuli, or imbedded in their substance.

ECTOCARPUS *brachiatus*; *frond* finely tufted, feathery, much branched; the branches free, opposite or quaternate; ramuli opposite, spreading; capsules imbedded in the branches, forming oblong swellings situated on the lesser branches or in the axils of two opposite ramuli.

ECTOCARPUS *brachiatus*, *Harv. in Hook. Br. Fl.* vol. ii. p. 326. *Man.* p. 42. *Wyatt. Alg. Danm.* no. 174.

ECTOCARPUS *cruciatus*, *Ag. Sp. Alg.* vol. iii. p. 44. *Endl. 3rd Suppl.* p. 21.

CONFERVA *brachiata*, *Eng. Bot.* t. 2571.

HAB. Rare. At Cley, on the coast of Norfolk, in ditches of brackish water, among *Enteromorpha compressa*, 1808, *Sir W. J. Hooker*; in the sea, growing on *Rhodomenia palmata*, at Torquay, *Mrs. Griffiths*. Youghall, July 1837, *Miss Ball*. Lambray, 1838, *Mr. W. Thompson*.

GEOGR. DISTR. Only known on the coast of England, and east and south of Ireland.

DESC. *Frond* 2—4 inches high, finely tufted, wavy and feathery; the main stems slightly entangled, excessively branched, all the branches and branchlets opposite or quaternate; the lesser branches generally naked below, but furnished in their upper half with one or two pair of opposite spreading ramuli, which are in like manner furnished with similar smaller ones. *Capsules* immersed in the joints of the branches, often containing a double or bipartite mass, usually situate at the nodes of the branchlets. Colour a pale olive green.

There is some confusion in the history of this plant, which is one reason why I give it an early figure in this work. In the year 1801, Mr. Dawson Turner, and in 1808, Sir W. J. Hooker, found in ditches of brackish water by the sea side on the Norfolk coast a plant of which a figure and description appeared in the 'English Botany' under the name of *Conferva brachiata*. That figure evidently represents a species of *Ectocarpus*, having opposite branches and immersed fruit. The Norfolk plant has not been found of late years, and no specimen now exists in Sir W. J. Hooker's Herbarium. The English Botany plate consequently remained for many years the only record of the species, until Mrs.

Griffiths discovered in Torbay a plant possessing apparently the leading or *essential* characters of the Norfolk one, but growing in the open sea and always as a parasite on *Rhodomenia palmata*. Meanwhile Agardh described a new *Ectocarpus brachiatus*, a native of the Baltic, and conferred the name *E. cruciatus* on the E. Bot. species. The name *brachiatus* no doubt belongs to the Norfolk plant, and if the Torbay individuals now figured and described, and of which excellent specimens have been published in Mrs. Wyatt's "*Alga Danmoniensis*" are essentially different, a new name should be conferred on them; and Agardh's *E. brachiatus*, if it be not the same with *E. sphærophorus*, Carm., might be called *E. Agardhianus*.

Fig. 1. ECTOCARPUS BRACHIATUS:—*natural size*. 2. A portion of the frond:—*magnified*. 3. Apex of a branch. 4. Fragment, to show the imbedded fruit:—*more highly magnified*.



PLATE CXXXII.

ECTOCARPUS MERTENSII, *Ag.*

GEN. CHAR. *Fronde* capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit* either spherical, elliptical, or lanceolate *utricles* (or *spores*), borne on the ramuli, or imbedded in their substance. ECTOCARPUS (*Lyngb.*),—from *εκτός*, *external*, and *καρπός*, *fruit*.

ECTOCARPUS *Mertensii*; distichous; branches opposite, of unequal length, linear, mostly undivided, closely set, throughout their whole extent with slender, subulate, opposite ramuli; joints of the stem longitudinally striate, transparent, with a central coloured band, rather shorter than their breadth; spores binate, imbedded in the ramuli.

ECTOCARPUS *Mertensii*, *Ag. Sp. Alg.* vol. ii. p. 47. *Hook. Br. Fl.* vol. ii. p. 327. *Wyatt, Alg. Danm.* no. 130. *Harv. Man.* p. 43. *Endl. 3rd Suppl.* p. 21.

CONFERVA *Mertensii*, *E. Bot.* t. 999. *Dillw. Conf. Suppl.* p. 79.

HAB. On mud covered rocks and stones, near low-water mark and at a greater depth. Annual. April and May. Rare; but pretty generally distributed. Yarmouth, *Mr. Wigg.* Coast of Durham, *Mr. W. Backhouse.* Torbay, *Mrs. Griffiths.* Salcombe, very fine, *Mrs. Wyatt.* Sidmouth, *Miss Cutler.* Marazion and Ilfracombe, *Mr. Ralfs.* Mount Edgecumbe, Plymouth, *Rev. W. S. Hore* and *Mr. Rohloff.* Bantry Bay, *Miss Hutchins.* Dredged in Strangford Lough, *Mr. W. Thompson.* Howth, *Dr. Coulter.* Cove of Cork and Malahide, *W. H. H.* Carrickfergus and Roundstone Bay, *Mr. Mc' Calla.* Orkney, *Rev. J. H. Pollexfen.*

GEOGR. DISTR. British Islands. Atlantic shores of France.

DESCR. *Fronde*s densely tufted, but not in the least matted together. *Stems* from two to six, or more rarely twelve inches in length, nearly or entirely simple, closely furnished from the base to the apex with distichous, opposite, erecto-patent, lateral branches, which are of very unequal length, long and short being indiscriminately mixed together. These primary branches are, in large specimens, furnished with a second or third series, also very unequal in length, but none of them long, so that the general outline of the main branch is narrow. Both primary and secondary branches are pectinated, at every joint, with a pair of opposite, subulate, patent ramuli, which in young specimens terminate in a long, hair-like acumination, that drops off at a later period of growth. *Joints* of the stem rather shorter than broad, with a central band; those of the ramuli very many times shorter than broad, each formed of several cellules. *Spores* immersed in the subulate ramuli about the centre, growing in pairs, separated by a transparent line, each spore of a half ellipsoid shape, dark olive. *Colour*, when young, a clear brown olive, becoming foxy when old, and acquiring a greenish shade, if dried after some steeping in fresh water. *Substance* flaccid. The plant closely adheres to paper.

This charming plant, one of the rarest and most beautiful of the filiform marine Algæ, is one of the many interesting discoveries which we owe to Mr. Lilly Wigg, of Yarmouth, who first gathered it in the year 1799. It was named by Mr. Turner in compliment to the late celebrated Professor Mertens, of Bremen, "as well to bear testimony to his unwearied zeal and extensive knowledge of the confervoid Algæ, as in token of private respect"; and, though not the discoverer of this species, it cannot be questioned that the compliment was very appropriately and justly paid. No botanist of his day, with the exception of Mr. Turner himself, was so deeply skilled in the study of marine botany, as Professor Mertens.

Ectocarpus Mertensii, from the date of its first discovery to the year 1834, was found in such small quantities that it was known to very few botanists, except by the figure in 'Eng. Bot.' In that year it was gathered by Mrs. Griffiths, Miss Cutler, and Mrs. Wyatt, in three stations on the Devonshire coast, and in considerable plenty; and, more recently, it has been detected in many localities by various collectors. In land-locked harbours, such as Salcombe, it attains a very large size, some of Mrs. Wyatt's specimens being upwards of a foot in length. In more exposed places it seldom exceeds three or four inches. It is in greatest beauty in April and May, at which time its fronds are glossy, beautifully feathered and of a clear olive; later in the season it becomes browner, and loses much of the feathery appearance. In some respects it exhibits a transition to *Spha-celaria*, proving the close connection which exists between that genus and *Ectocarpus*, and the little necessity there is for placing them in different families, as is now done by Continental authors.

Fig. 1. *ECTOCARPUS MERTENSII*:—*of the natural size*. 2. Upper portion of a branch. 3. Fertile ramuli, with the immersed, binate spores. 4. Apex of a young ramulus, ending in a fibre:—*all more or less highly magnified*.



PLATE CI.

MYRIOTRICHIA CLAVÆFORMIS, *Harv.*

GEN. CHAR. *Filaments* capillary, flaccid, jointed (simple), beset with quadrifarious, simple, spine-like ramuli, clothed with byssoid fibres. *Fructification*, elliptical *utricles* (or spores?) containing a dark-coloured sporaceous mass. MYRIOTRICHIA (*Harv.*),—from *μύριος*, a *thousand*, and *ῥιξ*, a *hair*.

MYRIOTRICHIA *clavæformis*; stem densely beset with quadrifarious ramuli, which gradually increase in length from the base upwards, giving the frond a club-shaped figure.

MYRIOTRICHIA *clavæformis*, *Harv. in Hook. Journ. Bot.* vol. i. p. 300. t. 138. *Harv. in Mack. Fl. Hib.* part 3. p. 182. *Wyatt, Alg. Danm.* no. 131. *Harv. Man.* p. 44. *Endl. 3rd Suppl.* p. 24.

HAB. Parasitical on *Chorda lomentaria*. Annual. Summer. Bantry Bay, *Miss Hutchins.* Torquay, *Mrs. Griffiths.* Cable Island, near Youghal, *Miss Ball.* North of Ireland and Ballantræ, Ayrshire, *Mr. W. Thompson.* Howth and Balbriggan, *Miss Gower.* Mount's Bay, Cornwall, *Mr. Ralfs.* Falmouth, *Miss Warren.* Jersey, *Miss White.*

GEOGR. DISTR. British Islands.

DESCR. *Fronde*s tufted, half an inch or rather more in length, flaccid, subgelatinous, simple, linear-clavate, dark olive brown, surrounded by colourless fibres. Primary thread articulated, bare of ramuli below for a short distance above the base, upwards densely beset with patent simple quadrifarious ramuli, the lowermost of which are very short or merely rudimentary, the uppermost gradually longer and those toward the apex frequently producing, in old specimens, a second series near their tips. From the apices and sides of the ramuli, and from the lower part of the stem, spring innumerable slender, byssoid, colourless, long-jointed fibres, which greatly increase the bulk of the plant, and impart to it the peculiar softness. Articulations of the stem and ramuli shorter than their breadth. *Utricles* elliptical, or somewhat ovate, sessile on the main threads, occupying the position of a ramulus, having a pellucid limbus and containing a dark-coloured sporaceous mass. *Colour* dark olivaceous brown.

This curious little parasite, which, in some seasons, is not uncommon on the fronds of *Chorda lomentaria*, though far less common than the closely-allied *M. filiformis*, was discovered by Miss Hutchins about the year 1808, a circumstance unknown to me when, in 1834, I published it as a novelty in the 'Journal of Botany. To the majority of botanists it was then indeed new,

for no notice had been taken of Miss Hutchins's specimens in 'Eng. Bot.'; and no other observer had collected the plant until Mrs. Griffiths, in 1833, gathered the specimens which were described by me.

In the account which I first published respecting it, I regarded it as more nearly allied to *Ectocarpus* than to any other genus, an opinion to which I still adhere, although Endlicher has placed it nearer to *Cladostephus*, to which its quadrifarious ramuli bear some resemblance. In the long hyaline fibres which plentifully cloth it in every state, it is distinct from both. These *fibres* I formerly described as being forked; on a more careful examination I cannot detect this character. They appear to issue indiscriminately from the apices, and the lateral sides of the ramuli.

In the outline of the frond there is much resemblance to *Dasycladus clavæformis*, a curious Mediterranean Alga belonging to *Siphonææ*; but the structure is very widely different.

Fig. 1. A frond of *Chorda lomentaria* infected with tufts of MYRIOTRICHIA CLAVÆFORMIS:—the natural size. 2. A tuft of *Myriotrichia clavæformis*. 3. Two fronds, of different ages. 4. A section showing a utricle, subtended by a ramulus, and some of the hairs which clothe the latter:—all more or less magnified.



PLATE CLVI.

MYRIOTRICHIA FILIFORMIS, *Harv.*

GEN. CHAR. *Fronds* capillary, flaccid, jointed, (simple) beset with quadri-farious, simple, spine-like ramuli, clothed with byssoid fibres. *Fructification*; ellipticle *utricles* (or *spores*) containing a dark-coloured mass. MYRIOTRICHIA (*Harv.*),—from *μυrios*, a *thousand*, and *τριξ*, a *hair*.

MYRIOTRICHIA *filiformis*; stem filiform, slender, often flexuous or curled, beset at irregular intervals with oblong clusters of short, papillæform ramuli.

MYRIOTRICHIA *filiformis*, *Harv. Man.* p. 44. *Wyatt, Alg. Danm.* no. 213.

HAB. Parasitical on *Chorda lomentaria*, often accompanying *M. clavæformis*. Annual. Summer. Not uncommon on the English and Irish shores.

GEOGR. DISTR. British Islands.

DESCR. *Fronds* an inch or more in length, very slender, densely clothing the fronds of *Chorda lomentaria*, tufted, flexuous, simple, filiform, at intervals appearing thickened or knobbed; the knobbed portions formed of exceedingly dense, short, papillæform ramuli. Both the ramuli and the main stems emit numerous, long, simple, colourless, byssoid fibres. *Articulations* shorter than broad, filled with dense, granular matter. *Spores* spherical, with a hyaline pericarp, variously scattered along the main filament. *Colour* varying from a yellowish olive to a pale brown. *Substance* tender, and more or less gelatinous, closely adhering to paper, and usually glossy when dry.

A comparison of the figure here given, with that of *M. clavæformis* at Plate CI., will best show the differences between these two plants. It will be seen that while in the former the ramuli regularly increase in length from the base upwards so as to give the frond a club-shaped, or very slender pear-shaped outline; in this they preserve nearly an equal length in different parts of the frond, and are collected into oblong clusters, separated by spaces bare of ramuli. In all other respects the two plants closely resemble each other, and as they are frequently found intermixed on the same frond of *Chorda lomentaria*, I formerly regarded the present as merely a state of *M. clavæformis*. The merit of having correctly distinguished these closely allied species is due to Mrs. Griffiths, who first pointed out the peculiar characters of both.

M. filiformis is much the most abundant species, and is, indeed, very generally to be found clothing the *Chorda*, when the latter grows in small shallow pools, exposed to strong sunlight. In such localities almost every frond of *Chorda lomentaria* is converted into a soft, cylindrical brush, from the multitudes of these little parasites, clothed with their gelatinous, transparent hairs, which, while the plant remains in the water, stand out on every side, keeping each little filament free of its neighbour. When drawn into the air, the whole falls together in a gelatinous mass.

In the list of British Algæ given at the conclusion of our first volume, the names *Ectocarpus simplex*, Ag., and *E. villum*, Harv., occur. Since that list was printed I have made a more careful examination of the specimens on which these names were imposed, and fear that both are referable to young states of *M. filiformis*. Never having seen an authentic specimen of Agardh's *E. simplex*, I cannot take it upon me to pronounce his plant to be identical with the Jersey plant so named by me; but judging from the description given by that author, I think it very probable that his plant is the same as ours, and therefore to be regarded as a synonyme of *M. filiformis*. In strict priority, should this opinion be established, the specific name "*simplex*" would belong to our present species, but as this word denotes a character common to the genus, it seems undesirable to adopt it for a species.

Fig. 1. A plant of *Chorda lomentaria* infested with MYRIOTRICHIA FILIFORMIS:—*of the natural size*. 2. Fronds of the latter:—*magnified*. 3. Small portion of a frond—*highly magnified*.
